LABORATORY INVESTIGATION OF FLOW CHARACTERISTICS OF A SUTRO WEIR

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DECLARATION

I, Ahmed AminuOhueyi hereby declare that this research entitled '**LABORATORY INVESTIGATION OF FLOW CHARACTERISTICS OF A SUTROWEIR'** has been carried out by me under the close supervision of Dr. J.A. Otun and Dr. M.A. Ajibike. It has not been submitted in any previous publications for the award of any certificate, degree or higher degree. All sources of information are duly acknowledged by means of references.

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AHMED AMINU OHUEYI **DATE**

CERTIFICATION

This research entitled '**LABORATORY INVESTIGATION OF FLOW CHARACTERISTICS OF A SUTROWEIR**' meets the requirement for the award of Master of Sciences in Water Resources and Environmental Engineering of Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This research thesis is dedicated to Allah (SubhanahuwaTa'ala) for His guidance and to my late father Mallam Ahmed Omonoba (May Allah have mercy on him).

ACKNOWLEDGEMENT

All praises are due to Allah. We praise Him, seek His help and ask for His forgiveness. We seek refuge in Allah from the evil in our souls and from our sinful deeds. Whomsoever Allah guides, no one can misguide. And whomsoever Allah misguides, no one can guide. I bear witness that there is no one worthy of worship except Allah. And I bear witness that Muhammad (SallaAllahuAlaihiwasalam) is His servant and messenger.

My heart warm appreciation goes to my dear mother for her advice and prayers. Behind every successful man is a woman. Words may not be enough to express my sincere gratitude to my dear wife mallama Sherifa Seriki Oiza Ahmed for her courage and trust. Your moral support was what gave me the courage to continue against all odds. May Allah reward you abundantly for standing by me during the trial times. This list cannot be completed without mentioning the enormous contribution of my brother and father Alh. A.O Ahmed for his moral and financial support. To my darling children Musab and Nasiba, thanks for your patience and understanding. My special thanks also goes to my inlaws Mr and Mrs Seriki for their moral and financial support.

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ABSTRACT

Linear proportional weirs refer to as sharp crested weir in which the discharge is linearly proportional to the head over the weir crest and tend to have high accuracy when compared with the non linear ones. The main objective of the study was to investigate the flow characteristics of a Sutro weir in an open channel.In this research work the flow characteristics of a Sutro Weir were studied. The assumption of the linearity of the flow through the weir was investigated. In addition, the effects of the rectangular base height (s) and the radius (R) of the curved section on the head measured above the weir sill were monitored. The experiments were conducted in a flume having a working length of 6m with a cross section 0.3m wide and 0.3m deep. A total of 45 laboratory experiments were carried out on nine different models for five different discharges. The models made of wood were grouped in to two sets of which set one(1) consists of five models of constant radius of 9cm and varying base heights. The set 2 consists of four models of constant weir base height of 4cm and varying curve radius.The results showed that the radius (R) of the curved section has more effect on the head measured above the weir sill compared with the rectangular base height(s). The set 2 models showed a better linear relationship between the actual discharge and the head measured above the weir sill compared to the set 1 model.

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List of Abbreviations

X	Top width of the weir
R	Radius of the curved section
s	Height of the rectangular base
h_d	Head over the weir sill
h	Head above the rectangular section
Q_a	Actual discharge
Q_t	Theoretical discharge
C_d	Coefficient of discharge
h^1	Depth of water measured from the channel base
t_{av}	Average time calculated
m	Mass of water
W	Bottom width of the weir
g	Acceleration due to gravity
x^1	Distance from the weir
M 11	Set 1 model 1
M12	Set 1 model2
M 13	Set 1 model 3
M 14	Set 1 model 4
M 15	Set 1 model 5
M 21	Set 2 model 1
M 22	Set 2 model 2
M 23	Set 2 model 3
M 24	Set 2 model 4

CHAPTER ONE

INTRODUCTION

1.1 Preamble

The ever growing demand for water makes the understanding of water measuring techniques important and necessary. Accurate flow measurement is very important for proper and equitable distribution of water among water users.Gertrudys (2006) wrote that the information concerning the volume of available water is very helpful in planning for its future use and distribution.

The effective use of water for irrigation requires that flow rates and volumes be measured and expressed quantitatively. Measurement of flow rates in open channels is difficult because of non-uniform channel dimensions and variations in velocities across the channel. Weirs allow water to be routed through a structure of known dimensions, permitting flow rates to be measured as a function of depth of flow through the structure. Allens and Dalton (2002), mentioned that one of the simplest and most accurate methods of measuring water flow in open channels is by the use of weirs.

Open channel flow is flow in any channel in which the liquid flows with a free surface, such as tunnels, partially filled pipes, canals, streams, and rivers. Flow measurement is the quantification of fluid movement parameters.Boiten (1993) stated that since the early days of hydraulics, hydraulic structures have been installed in open channels with a free water level to estimate discharge based on the measured upstream water level.

A weir is basically an obstruction in an open channel flow path. A weir functions by causing water to rise above the obstruction in order to flow over it. The height of water above the obstruction correlates with the flow rate, so that measurement of the height of the flowing water above the top of the weir can be used to determine the flow rate by the use of an equation, graph or table. The top of the weir, which is used as the reference level for the height of water flowing over it, is called the crestof the weir. Weirs are typically classified as being either sharp-crested or broad-crested. Sharp crested weirs are widely used for the purpose of flow measurement, flow diversion and water level control in hydraulics, irrigation, and environmental projects. Rectangular, triangular, cipolletti, circular and sutro are some of the important shapes of sharp crested weirs (Novac, 2000).

Weirs are well suited for measuring low flows, particularly where there is little head available. In addition to being used to measure flows, weirs are commonly used in wastewater treatment systems in secondary clarifiers to ensure uniform flow distribution along the effluent channel. Weirs are not generally considered suitable for raw wastewater (influent) flow measurement as solid materials can accumulate on the upstream side of the weir that can disturb the conditions for accurate discharge measurement or even block the weir (Novac, 2000).

Regardless of their performance, properties, ages, or conditions, it should be noted that weirs are engineering structures that have to function in difficult conditions. As one of the main components of dam construction and water projects, weirs are important structures built for various purposes. Two of the most important functions of weirs are measurement of water discharge and adjustment of the water level in primary and secondary channels. Considering the complex work they do, weirs should be strong, reliable, and highly efficient so that they can readily be put to use (Rasool and Ensiyeh, 2012).

Proportional weirs and their discharge characteristics have been under investigation ever since the concept of such weirs was first proposed by Stout (1897). These weirs have a profile which ensures a certain relationship between the head on the weir and the discharge. Linear proportional weirs are used as flow measuring devices, and as outlets for settling basins, grit chambers and dosing siphons. There are various types of linear proportional weirs depending on the shape of the base profile, which may be parabolic, triangular, trapezoidal or rectangular.

The “sutro weir” is the most common of the linear proportional weirs with rectangular bottom sections. The sutro profile is asymptotic at the bottom (Fig.2.1) leading to an infinitely wide base (Pratt, 1914).Sutro, 1914 tried to overcome this by assuming a known base in the form of a rectangular weir of depths, above which the weir profile is fitted. Recently, Keshava and Sashagiri (1968) presented a generalized mathematical theory of proportional weirs, and supported their theory with experimental verification. From the point of view of constructing the linear weir profile, the profile computations suggested by earlier investigators involve complex mathematical expressions. In engineering field applications, it is necessary to seek a solution which ensures ease of construction of the weir and provides the required accuracy in the linear head-discharge relationship. This was the motivation for Sutroin 1914 to develop a practical linear proportional weir and is known as the Sutro Weir. A designed shape is fitted for the Sutro weir which has a rectangular base.

The proportional weir is defined as a weir in which the discharge is linearly proportional to the head over an arbitrary reference level which, for the Sutro Weir, has been selected at a distance of one-third of the height of the rectangular section above the weir crest.

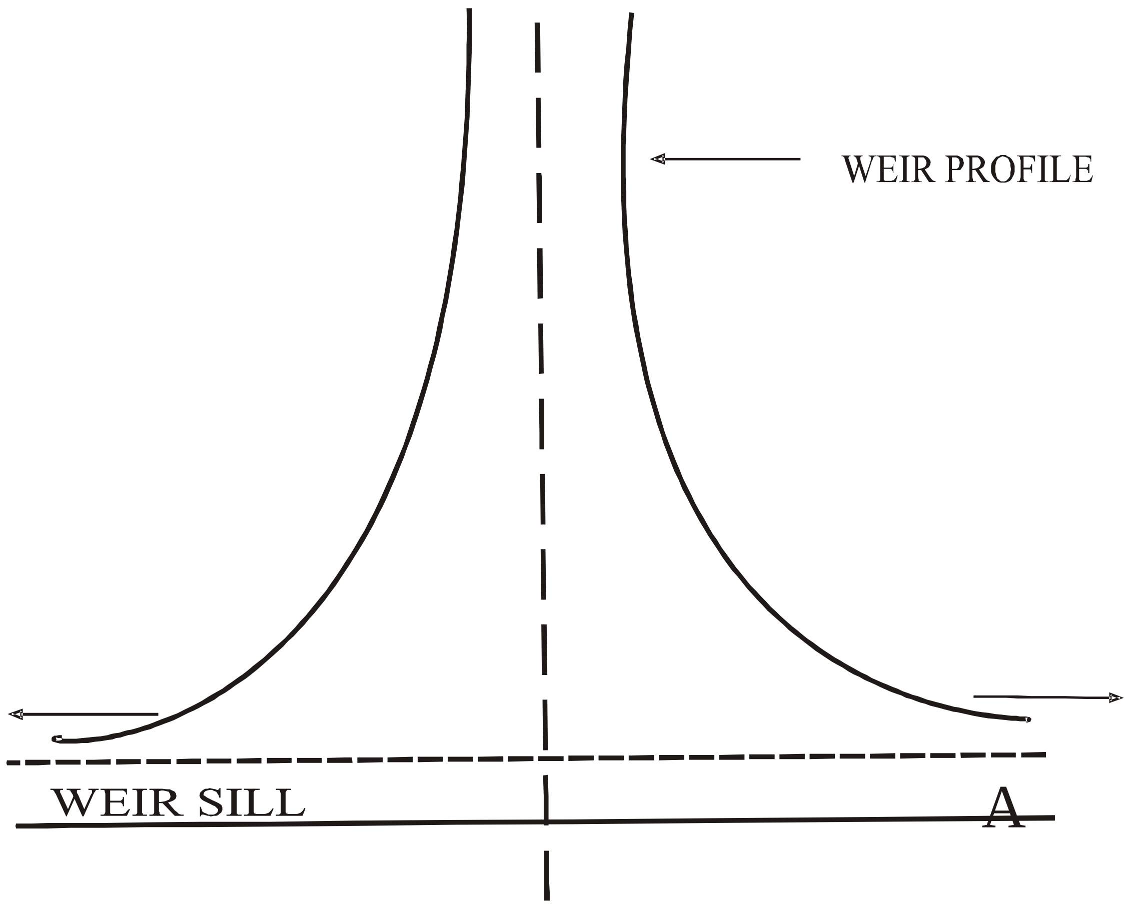


FIGURE 1.1 Flow pattern of a Sutro Weir with infinite width

1.2Aim and Objectives

The aim of this study is to investigate the flow characteristics of a sutro weir in open channel.

The specific objectives are:

1. To determine the head-discharge relationship of a sutro weir.
2. To investigate the range of coefficient of discharge for which the linearity of Q-h relationship of the sutro weir is valid.
3. To study the effect of changing base height on the head above the crest.
4. To determine the water surface profile of a sutro weir.

1.3Statement of Research Problem

The wide application of weirs in the measurement of discharge in irrigation channels has made the study of weirs very important. The error recorded in the use of triangular, rectangular, circular and semi-circular weirs in measuring flow discharges makes the study of linear proportional weirs more relevant. The Sutro Weir has the ability to provide high flow measurement accuracy for both small and large flow rates.

1.4 JUSTIFICATION

The need to reduce to the barest minimum the error in the use non- proportional weirs in the measurement of discharge in an open channel is what necessitated this study. For linear proportional weirs, an error of 1% in the head measurement transmits an error of only 1% in the discharge computation compare to other non-proportional weir. (Swamee et al. 1991).

1.5Scope and Limitation

This research work is centered on the laboratory investigation of a Sutro Weir. The work shall also verify the linearity of the flow through the weir and to study the effect of changing base height on the head measured above the crest.

The major limitation encountered in the course of the study was the inability to consider a large flow rate during the experiment. In addition, my inability to consult previous literaturethe lack of recent works on this particular topic accounted for seeming old references cited.

CHAPTER TWO

LITERATURE REVIEW

2.1: Background

Flow measurement has long been studied by hydraulic engineers and multiple methods have been innovated in this regard. Trapezoidal and triangular weirs are used to measure the flow in open channels. In such weirs, discharge is non-linearly proportional to the head over the weir; therefore the graph of discharge-head is curvilinear while in linear weirs head-discharge relationship is a straight line with constant slope. Thus, the accuracy of linear weirs is more than non-linear weirs (Keshava and Giridhar; 1989). There have been several works carried out on the discharge characteristics of proportional weirs. Some of these works include:

(Leonard, 1975) carried out an experiment on a practical proportional weir consisting of a pair of quadrants of a circle. He observed that the line of discharge (Q) against head (h) passed through the origin.

(Lakshmana and Abdul, 1971) also carried out an experimental study on a linear proportional weir with a trapezoidal bottom, which showed that the coefficient of discharge (C_d) decreases with the head (h). For the Sutro Weir, it was observed by Doebler and Rayfield(1973) that the coefficient of discharge(C_d) exhibited a tendency to decrease at low heads, reaching a minimum value, and then increases.

Keshava and Giridha(1991) carried out an experiment on geometrically simple linear weirs using circular quadrants - bell mouth weirs. A detailed theoretical analysis of flow through a quadrant plate weir is made in the light of the generalized theory of proportional weirs, using a numerical optimization procedure. He showed that the flow through the quadrant plate weir has a linear discharge-head relationship valid for certain ranges of head. He further observed that the weir is associated with a reference plane or datum from which all heads are reckoned. In addition, the measuring range of the quadrant plate weir can be considerably enhanced by extending the tangents to the quadrants at the terminals of the quadrant plate weir. The importance of this weir (when the datum of the weir lies below its crest) as an outlet weir for grit chambers is highlighted. Experiments show excellent agreement with the theory by giving a constant average coefficient of discharge.

Similarly (Keshava et al., 1998) presented a paper on a linear weir with a comparatively large space below the crest for the collection of grit when used as an outlet weir for rectangular grit chambers. The profile of the weir is geometrically simple to fabricate in the form of a rectangular weir placed over two sectors of a circle separated by a distance. Additional simplicity is achieved in the fabrication, as a result of the elimination of the sharp corner near the crest associated with the earlier designed quadrant plate weir. It is shown that by having a suitable shape of the weir formed with optimum combination of geometrical parameters (width of the rectangular weir, the heights at which the circles are cut at top and the bottom) it is possible to obtain a linear weir having a discharge directly proportional to the head measured above a reference plane, having a very large measurable range of head. For all flows above the threshold depth and within certain ranges of head the discharge-head relationship is valid within ± 1% deviation from the theoretical discharge. The weir when used as an outlet for rectangular grit chambers maintains constant average velocity in the channel. The non measurable range law is valid) is restricted to be within the sectors. Experiments with two weirs having radii R = 0.10 m and 0.12 m (where R is the radius of the quadrant plate) are in excellent agreement with the theory yielding a constant average coefficient of discharge for each weir. The geometrical simplicity of the profile, accuracy of the weir and a large space for the collection of grit below the crest makes it attractive for the practicing engineer.

Recently, Baddour (2008) demonstrated the versatility of the polynomial weir by showing its ability to reproduce the behavior of a linear weir. Similarly, Vatankhah and Kouchakzadeh (2009) also developed a general form for the discharge relationship for polynomial weirs of nth order using the gamma function.

2.2 LINEAR PROPORTIONAL WEIRS

A proportional weir is one in which the discharge directly varies as h. The shape of the weir is such that the discharge varies linearly with head.The proportional weir is quite convenient and is generally used as control device in chemical dosing. By float-regulated dosing devices the flow over a proportional weir can be controlled. Hence are used in irrigation, in hydraulic, sanitary and chemical engineering Industry.

For a prescribed shape of weir, the discharge can be determined. In the case of a rectangular notch it is proportional to $h^{3/2}$, and in the case of a triangular (V-notch) the discharge is proportional to $h^{5/2}$, etc., where h is the head over weir.

In general, weir discharge is expressed by:

$$Q \alpha H^{n}_{d} \qquad (2.1)$$

If the weir is designed in a way that discharge changes linearly corresponding to H_d, where n=1, the weir is called proportional.

In fact the discharge passing these weirs is linearly proportional to water head over weirs. These weirs are used as controller in water divider systems, and also as structures of flow measurement and trappers of residues in stream openings. Linear proportional weirs have higher accuracy with minimum error, as compared to rectangular and triangular weirs in similar situations (Arora, 2005)

The linear proportional weir was devised by Stout (1897). This is of theoretical interest only as its width at base is infinite (figure 1.1). This was modified by Sutro to a practical linear proportional weir and is known as Sutro weir. A design shape is fitted for the Sutro weir which has a rectangular base (figure 2.1). It is to be noted that for flows above the base of the weir, the discharge is proportional to the head measured above a reference plane located at one third of the depths of the crest of the base weir.

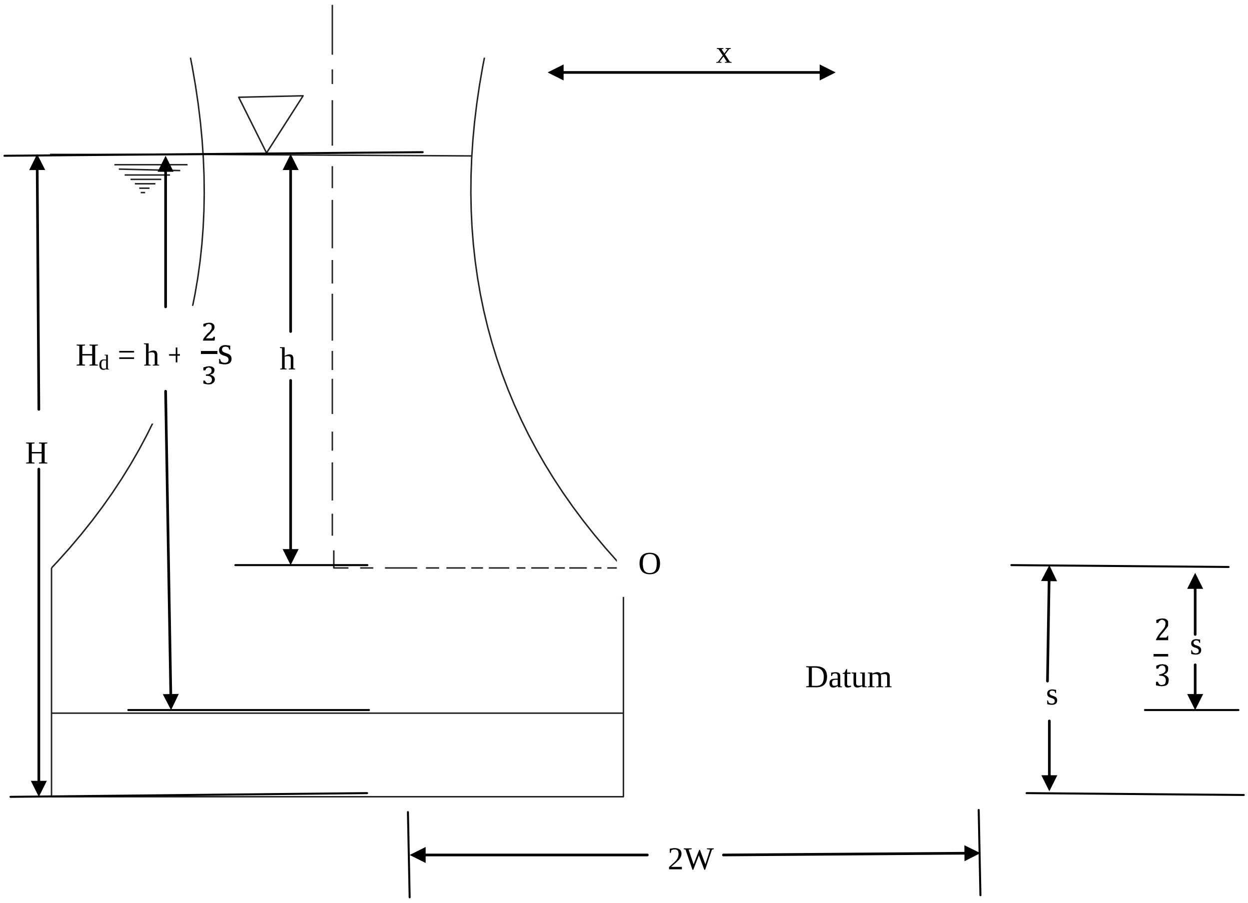


Figure 2.1: Flow pattern of the Sutro Weir

2.3FLOW MEASUREMENT IN OPEN CHANNELS

Open channel flow is flow in any channel in which the liquid flows with a free surface. Included are tunnels, partially filled pipes, canals, streams, and rivers. There are many methods of determining the rate of flow in open channels. Some of the more common include the timed gravimetric, dilution, velocity-area, hydraulic structures, and slope-hydraulic radius-area methods.

2.3.1 Timed gravimetric method

The flow rate is calculated by weighing the entire content of the flow stream that was collected in a container for a fixed length of time. This is practical for small streams of less than 25to 30 gallons per minutes (0.00167 – 0.002 m^3 /s) and is not well suited for continuous measurement.

2.3.2 Dilution method

The flow rate is measured by determining how much the flowing water dilutes an added tracer solution.

2.3.3 Velocity-area method

Measuring the mean flow velocity across a cross section and multiplying it by the area at that point to calculate the flow rate.

2.3.4 Hydraulic structure method

This method uses a hydraulic structure placed in the flow stream of the channel to produce flow properties that are characterized by known relationships between the water level measurement at some location and the flow rate of the stream. Therefore, the flow rate is determined by taking a single measurement of the water surface level in or near the restriction of the hydraulic structure.

2.3.5 Slope-hydraulic radius-area method

Measurement of water surface slope, cross-sectional area, and wetted perimeter over a length of uniform section channel are used to calculate the flow rate, by using a resistant equation such as the Manning formula.

The Gravitation, Dilution, and the Velocity area methods are more commonly used for calibration purposes. The Depth-Related methods (Hydraulic Structures) are the most common. The depth-related technique measures flow rate from a measurement of the water depth, or head. Weir and flumes are the oldest and most common devices used for measuring open channel flows.

2.4 Weirs

A weir is an obstruction in an open channel which constricts the flow and causes it to fall over a crest. Weirs consist of vertical plates (or concrete walls) with sharp crests across a flow. The top of the plate can be straight or notched. Weir plates are available in fiberglass, aluminum, or stainless steel. A weir can be classified in two broad categories: Sharp-Crested and Broad-Crested weirs.

2.4.1 Sharp crested weir

Sharp-Crested weir has a sharp metal blade along the bottom and sides of the crest. The top edge of the weir is thin or beveled with a sharp upstream corner. Various types include: triangular or v-notch, rectangular, trapezoidal (Cipolletti) and sutro. Sharp-crested weirs are most frequently rectangular, consisting of a straight, horizontal crest. If a weir is constructed with an opening width less than the channel width, the over-falling liquid, called the nappe, decreases in width as it falls. Because of this contraction, this type of weir is called contracted weir. If the opening of the weir extends the full channel width the weir is called a suppressed weir. A V-Notch weir is better suited to low flow streams with discharges less than 448.8 gpm (0.0299 m^3 /s). Contracted rectangular weirs are able to measure much higher flows than V-Notch weirs. Cipolletti weirs are less accurate than rectangular or V-Notch weirs. However, in the case of proportional (sutro) weir the discharge is proportional to the head. Figure 2.2 shows a longitudinal section of flow over a sharp-crested weir.

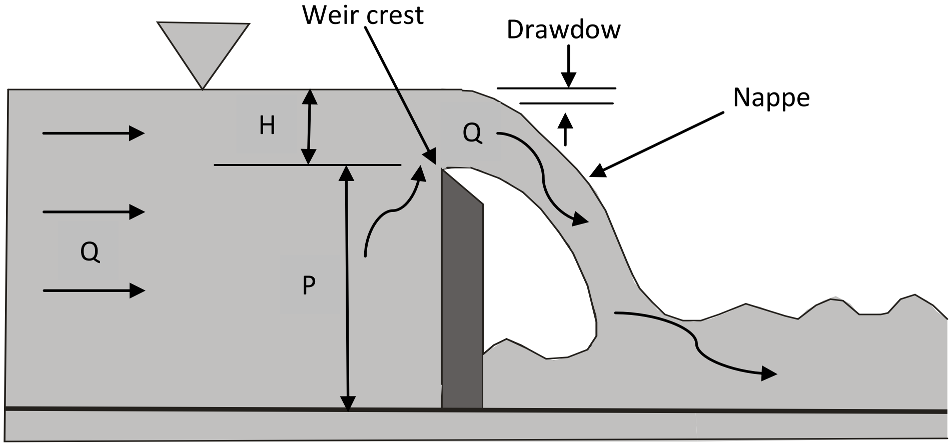


Figure2.2: Longitudinal Section of flow Over a Sharp crested weir

Some of the terminologies used in connection with sharp-crested weirs, illustrated in Figure2.2, are summarized as follows:

Definition of terms

Drawdown, as shown in figure 2.2, occurs upstream of the weir plate due to the acceleration of the water as it approaches the weir.

The term **Nappe**is used for the sheet of water flowing over the weir.

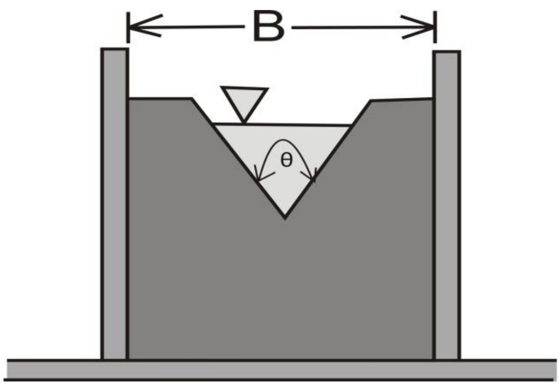
Free flow is the flow condition over a sharp-crested weir when there is free access of air under the **nappe.**

The **Velocity of approach** is equal to the discharge, Q, divided by the crosssectional area of flow at the head measuring station, which should be upstream far enough, that it is not affected by the **drawdown**.

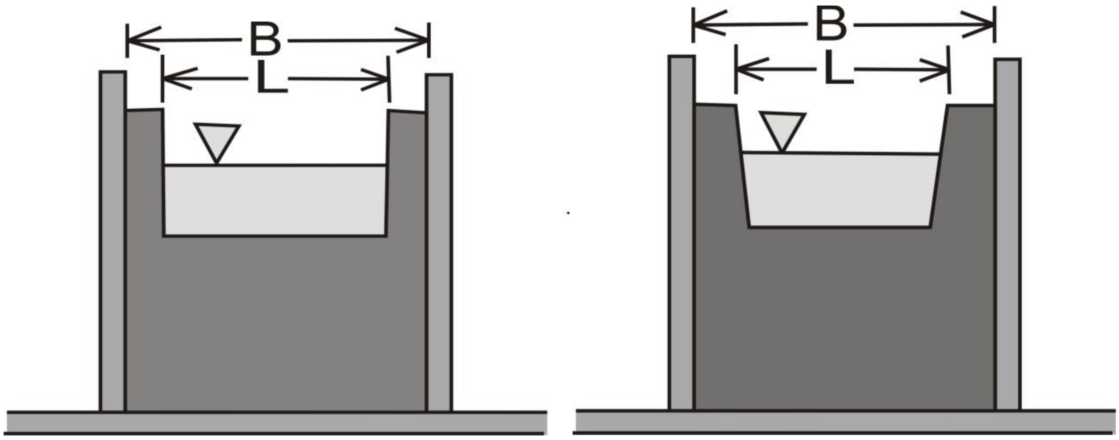
Submerged flow or a **submerged weir** occurs when downstream water rises above the weir crest elevation.

The equations to be discussed for sharp-crested weirs all require **free flow** conditions. Accurate measurement of flow rate is not possible under **submerged flow** conditions.

Four common sharp-crested weir shapes will be discussed. The shapes are**V-notch**,**suppressed rectangular, contracted rectangular**, and **cipolletti**



(a) V-notch (b) Suppressed rectangular weir



(c) Contracted rectangular weir (d) Cipolletti weir

Figure 2.3: Common sharp-crested weir shapes

2.4.2Broad-Crested Weir

A weir having a broad crest (or sill) is known as broad crested weir. In this type of weir, the crest is wide enough to cause adherence of the nappe to the top surface of the sill. The discharge over a broad crested weir depends upon the heads H,h and the length L as shown in the figure 2.4.(Rajput, 2006).

Let us assume that the sill is sufficiently wide to cause uniform distribution of velocity at the downstream end. Let V be the velocity at the downstream end. Applying Bernoulli equation to both points and neglecting losses,

$$H = h + \frac{v^2}{2g}$$

$v = \sqrt{2g(H-h)}$

The discharge over the weir,

$Q = C_d \times$ area of flow $\times$ velocity

$= C_d \times L \times h \times v$

$= C_d \times L \times h \times \sqrt{2g(H-h)}$

Where,

H = head of water in the upstream side of the weir

h = head of water on the downstream side of the weir

V = velocity of the water on the downstream side of the weir

L = length of the weir

C_d = coefficient of discharge

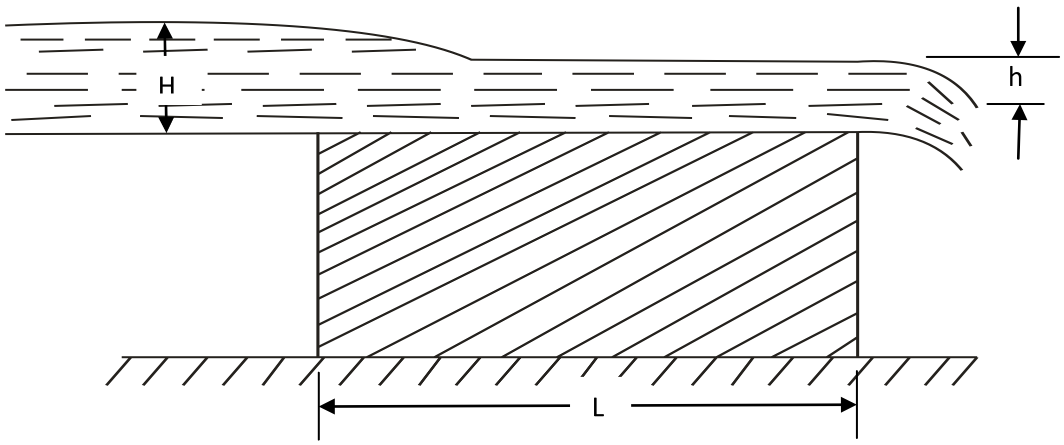


Figure 2.4: Flow over broad crested weir

2.5Flow over weirs

Flow over weirs is complicated because of sharp curvilinear streamlines besides consisting of eddy regions, accelerating and retarding flow zones. The existing solution is semi-empirical in nature.

2.5.1 Factors Affecting Flow over Weirs

The several factors affecting the flow are

i. The head

ii. Fluid properties and Temperature Effects

iii. Approach and tail water conditions

iv. Weir Geometry

v. Measurement inaccuracies

2.5.1.1 Fluid Properties and Temperature Effects

The fluid properties which influence the discharge over the weir are viscosity and surface tension. In case of water flowing over the weir these effects are negligible at heads higher than 3 cm.

Temperature variations influence the fluid properties like viscosity and surface tension. The variations in these fluid properties in turn will influence the discharge over the weir. This type of problem is of importance to chemical Engineers and Sanitary Engineers. Another closely associated problem is the influence of temperature variations on the aeration at weirs. In many weirs in industrial processes substantial aeration takes place when waterfalls over the weirs. The rate of absorption of atmospheric oxygen by the water flowing over the weir increases with increasing temperature. However, the effect of small temperature variations on the water flow over weirs is negligible.

2.5.1.2 Approach Flow Conditions

The distribution of velocities in the approach flow has a definite influence on the discharge over the weir. Kinetic energy correction factor can account for the variation in the approach velocity. The value of this coefficient depends on the degree of non-uniformity of the approach velocity distribution.

A weir not normal to the approach flow is called a 'skew Weir'. In skew weirs there is a discharge concentration towards one side. The discharge was found to be greater than that over a normal weir.

2.5.1.3 Tail Water Conditions

At high tail water levels, the flow over the weir passes in a sub critical state. In this case, the discharge is dependent on both the upstream and the downstream water levels. The Weir, in this case, is said to be submerged and the flow is non-modular. "The ratio of the downstream and the upstream water depths above the weir crest is defined as the submergence ratio, σ“. The limiting value of σ where the tail water also begins to influence the rate of flow is called the submergence limit. Beyond submergence limit, the discharge reduces. The shape of the nappe may affect the discharge. The modification of the nappeconditions result in small variations of the order of 1 to 2%in the discharge.

2.5.1.4Weir Geometry

The weir geometry influences the coefficient of discharge. It depends upon the pressure distribution along the geometric profile, boundary layer growth and separation zones.

2.5.2 Mode of operation of weirs

Weirs operate on the principle that an obstruction in a channel will cause water to back up, creating a head behind the barrier. The head is a function of flow velocity, and therefore, the flow rate through the device. The discharge through weirs and flumes is a function of water level, so water level measurement techniques must be used. Staff gauges and float-operated units are the simplest devices used for this purpose.

2.5.3 Surface profile study

In order to determine the point gauge location, a water surface profile study was made for different discharge values. Water depth is recorded for different discharges and the graph was plotted to illustrate the water surface profile in the channel.

2.5.4 Shape of the Sutro Weir

The Weir has a rectangular base of width 2W and height s as shown in figure 2.1. The Weir is assumed to be symmetrical about the ordinates axis.

2.5.5 Weir Equation

The discharge over the sutro weir is given by the equation below:

$Q = C_0 (h + \frac{2}{3} s)$ (2.1)

Where C_0 is the proportionality constant.

$C_0 = Wks^{1/2}$,

$K = 2C_d\sqrt{2}g$

(g =9.81), h is the head measured above the rectangular base of the weir, H is the total head of the flow and h_d *is* the head over the reference plane. C_d ranges between 0.0597 to 0.619.

$C_d = \frac{Qa}{Qt}$ (2.2)

Where,

C_d = discharge coefficient

Q_a = actual discharge m^3/s

Q t = theoretical discharge m^3/s

$Q\ a = \frac{m}{tav\ \rho}$ (2.3)

Where,

m = mass of water kg

t_{av} = average time sec

$\rho =$ density of water Kg/ m^3

W = width of the weir model

2.5.6 Weir models dimensions

Nine different wooden models of Sutro Weir were fabricated. The models dimensions were arbitrarily chosen to fit into the flume dimension. These dimensions for both sets of models are shown in tables 2.1 and 2.2 respectively.

Table 2.1: Set 1 model dimensions

Model no	s (cm)	h (cm)	H (cm)	x (cm)	R (cm)
1	4	6	10	8	9
2	6	8	14	8	9
3	8	10	18	8	9
4	10	12	22	8	9
5	12	14	26	8	9

Table 2.2: Set 2 model dimensions

Model no	s (cm)	h (cm)	H (cm)	x (cm)	R (cm)
1	4	6	10	4	11
2	4	6	10	6	10
3	4	6	10	8	9
4	4	6	10	10	8

CHAPTER THREE

MATERIALS AND METHODS

3.1 Materials

The entire experiment was conducted in the hydraulic laboratory of the Department of Water Resources and Environmental Engineering, A.B.U, Zaria.To undertake the investigations the following materials were used.

3.1.1 Experimental Models

Nine different experimental models ofsutro weirs made of wood were fabricated. The models consist of two different sets. The first set consists of five models of constant radius of 9cm and a varying value of s(the height of the rectangular base). The values of s are 12cm, 10cm, 8cm, 6cm and 4cm.The second sets consists of four models of constant value of s (4cm)with varying radius(R) of11cm, 10cm, 9cm, 8cm and 7cm. The weir models have a constant width of 26cm.

Plate 2: Experimental Set 2 models

3.1.2 Flume

The experiments wereconducted in a rectangular laboratory tilting flume 6m long, 0.3m wide 0.3m deep. The flume measures discharges in terms of mass flow rate which were converted to volumetric discharge by dividing by the density of water.

Plate 3: Side view of the tilting flume used for the experiment

3.1.3 Point gauge

A point gauge was used to measure the water depth as well as the height above the crest during the experiments. The point gauge was located in accordance to Subramanya (1986) and Franzini and Fennimore (1997).

Plate 4: A typical point gauge used in the experiment

3.1.4 Weighing scale

This was placed at the receiving end of the flume in order to measure the mass flow rate over the weir.

Plate 5: The weighing scale used in the experiment

3.1.5 Stop watch

Stop watch was used to obtain the time required to get 20kg of water flowing over the weir in order to ascertain the discharge.

Plate 6: The stop watch used in the experiment

3.2: Methods

The method employed to conduct the experiment is described below.

3.2.1 Experimental Setup

The experiments were conducted in a flume having a working length of 6m with a cross section 0.3m wide and 0.3m deep as shown in plate 3. The side walls of the flume as well as its bottom are made of toughened glass. A movable point gauge shown in plate 4 was used to determine the head of the water above the weir crest. Water was circulated through the flume by an electrically driven centrifugal pump.Laboratory experiments were carried out on nine different models for five different discharges. The models were divided into two groups: set 1 and set 2.Each model was placed in the flume at a distance 3.0m downstream from the flume inlet. The set 1and set 2 models are shown in plate1 and plate 2 respectively. The model was glued to the bed and side of the flume. For each model five different discharges were allowed to flow through.The height of the water above the weir crest (h_d) wasmeasured by a precision point gauge.The discharge was collected in a measuring channel of known dimensions. A stop watch was used to determine the rate of flow into the measuring channel. Excess flow was directed into an adjacent floor channel, separated by a dividing steel plate. Diversion of excess flow was attained by means of a trolley mounted on wheels; the trolley was manipulated along the top of the measuring channel such that the flow through the sutro weir was discharged into the channel for a specified time.

3.2.2 Model run

Having fixed the model tightly to the bed of the flume, water was then released to flow over the weir. The point gauge was used to measure the head (hd) of water above the weir crest. This was done five times for each model by changing the speed of rotation of the pump to obtain the five different discharges of 6.24 l/s, 5.34 l/s, 4.40 l/s, 3.56 l/s and

2.98 l/s. The stop watch was used to obtain the time taken to collect 20 kg of water in the receiving basin. For each discharge, the time was measured three times average of which was used to calculate the actual discharge (Qa) using equation 2.1.

3.2.3 Model verification

Accurate selection of the coefficient of discharge is central to the correct determination of the constant (Co) in equation 2.1. In order to verify the model, I varied the coefficient of discharges (C_d) within the range given by Sutro (0.0597 to 0.619). For a particular actual discharge and the same value of head (h_d) measured above the weir crest, I varied the $C_d$from 0.0597 with a step increment of 0.1 up to 0.619 using Microsoft Excel. The percentage errors were also calculated to give a clearer picture of the variation between the Q_a and the Q_t. I then selected the C_d that gave me a theoretical discharge (Q_t) closet to the actual discharge for that particular value of $h_d$and Q_a. These tables were generated for the set1 and set 2 models as shown in appendix B and appendix C respectively. The constant terms Co, m and x used in the tables are given by the equations:

$Co = Wks^{1/2}$

$m = 2W\sqrt{2gs}$

$x = \frac{h}{100} + \frac{2s}{300}$

The values that appeared bold and underlined in appendices A and B were the chosen theoretical discharge closest to the actual discharge corresponding to the C_d used to obtain the value. The summary of the chosen discharge coefficients for both sets of model were presented in table 4.3 and 4.4.The graphs of Q-h relationship were also plotted. Plate 7 shows the model tightly fixed to the flume before the start of the experiment while plate 8 shows a typical experiment before readings were taken.

Plate 7: Model tightly fixed to the flume

Plate 8: Experiment in progress

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Set 1 and Set 2 models with varying and constant radius

Tables 4.1 and 4.2 respectively show the results of the experiment carried out on the two sets of models. The x, R, s are the weir model dimensions. The h_d is the measured parameter. The experiment was repeated five times for five different discharges of 6.24 l/s, 5.34 l/s, 4.40 l/s, 3.56 l/s and 2.98 l/s

Table 4.1 Experimental results of set1 models

model type	x (cm)	R(cm)	s (cm)	h_d (cm)	Q_a (l/s)
1	8	9	4	5.50	6.24
1	8	9	4	5.23	5.34
1	8	9	4	4.72	4.40
1	8	9	4	4.61	3.56
1	8	9	4	4.22	2.98
2	8	9	6	5.50	6.24
2	8	9	6	5.20	5.34
2	8	9	6	4.68	4.40
2	8	9	6	4.61	3.56
2	8	9	6	4.30	2.98
3	8	9	8	4.50	6.24
3	8	9	8	4.45	5.34
3	8	9	8	4.30	4.40
3	8	9	8	4.25	3.56
3	8	9	8	4.20	2.98
4	8	9	10	4.50	6.24
4	8	9	10	4.40	5.34
4	8	9	10	4.40	4.40
4	8	9	10	4.35	3.56
4	8	9	10	4.30	2.98
5	8	9	12	4.50	6.24
5	8	9	12	4.50	5.34
5	8	9	12	4.50	4.40
5	8	9	12	4.40	3.56
5	8	9	12	4.40	2.98

Table 4.2 Experimental results of set2 models

model type	x (cm)	R(cm)	s (cm)	h_d (cm)	Q_a (l/s)
1	4	11	4	5.3	6.24
1	4	11	4	4.93	5.34
1	4	11	4	4.50	4.40
1	4	11	4	4.20	3.56
1	4	11	4	3.95	2.98
2	6	10	4	5.54	6.24
2	6	10	4	5.16	5.34
2	6	10	4	4.78	4.40
2	6	10	4	4.50	3.56
2	6	10	4	4.20	2.98
3	8	9	4	5.56	6.24
3	8	9	4	5.23	5.34
3	8	9	4	4.94	4.40
3	8	9	4	4.60	3.56
3	8	9	4	4.20	2.98
4	10	8	4	5.60	6.24
4	10	8	4	5.25	5.34
4	10	8	4	4.81	4.40
4	10	8	4	4.51	3.56
4	10	8	4	4.38	2.98

From the tables 4.1 and 4.2, the coefficient of discharge (C_d) decreases with decrease in head (h_d).This result is in agreement with Doebler and Rayfield (1973) who observed thatSutro Weir has the tendency to decrease at low heads up to a certain minimum value and then increases. However, the increase was not observed in this study because all the discharges obtained could be considered as low discharges. To further support this claim, Lakshmana and Abdul (1971) carried out an experimental study on a linear proportional weir with a trapezoidal bottom, which showed that the coefficient of discharge, C_d, decreases with decrease head h_d.

As shown in Table 4.1, the variation in the values of rectangular base height (s) does not really show a significant effect on the head (h_d) above the weir sill. However, Table 4.2 shows that a weir model with smaller radius has more effect on h_d compared with the bigger ones.

The tables 4.3 and 4.4 respectively showed the range of coefficient of discharges that gave theoretical discharges closest to the actual discharges measured by both sets of models.

Tables 4.3: Summary of discharge coefficients for set 1 model

model type	s(cm)	h_d(cm)	C_d	Co	h+(2s/3)	Q_t(l/s)	Q_a (l/s)
1	4	5.50	0.1697	0.07817	0.0817	6.38	6.24
1	4	5.23	0.1497	0.06896	0.0790	5.45	5.34
1	4	4.72	0.1297	0.05975	0.0739	4.41	4.40
1	4	4.61	0.1097	0.05053	0.0728	3.68	3.56
1	4	4.22	0.0997	0.04132	0.0689	3.01	2.98
2	6	5.50	0.1197	0.06753	0.0950	6.42	6.24
2	6	5.20	0.1497	0.05625	0.0920	5.18	5.34
2	6	4.68	0.0897	0.05061	0.0868	4.39	4.40
2	6	4.61	0.0697	0.03932	0.0861	3.39	3.56
2	6	4.30	0.0597	0.03932	0.0830	2.80	2.98
3	8	4.50	0.0997	0.06495	0.0983	6.39	6.24
3	8	4.45	0.0797	0.05192	0.0978	5.08	5.34
3	8	4.30	0.0697	0.04541	0.0963	4.37	4.40
3	8	4.25	0.0597	0.03889	0.0958	3.73	3.56
3	8	4.20	0.0597	0.03889	0.0953	3.71	2.98
4	10	4.50	0.0797	0.05805	0.1117	6.48	6.24
4	10	4.40	0.0697	0.05077	0.1107	5.62	5.34
4	10	4.40	0.0597	0.03620	0.1107	4.81	4.40
4	10	4.35	0.0597	0.03569	0.1102	4.79	3.56
4	10	4.30	0.0597	0.02913	0.1097	4.77	2.98
5	12	4.50	0.0597	0.04763	0.1250	5.95	6.24
5	12	4.50	0.0597	0.03966	0.1250	5.95	5.34
5	12	4.50	0.0597	0.03918	0.1250	5.95	4.40
5	12	4.40	0.0597	0.03894	0.1240	5.91	3.56
5	12	4.40	0.0597	0.03591	0.1240	5.91	2.98

Tables 4.4: Summary of discharge coefficients for set 2 model

model type	s(cm)	h_d(cm)	C_d	Co	h+(2s/3)	Q_t (l/s)	Q_a (l/s)
1	4	5.3	0.1697	0.07817	0.0797	6.23	6.24
1	4	4.93	0.1497	0.06896	0.0760	5.24	5.34
1	4	4.50	0.1297	0.06435	0.0717	4.28	4.40
1	4	4.20	0.1097	0.05053	0.0687	3.47	3.56
1	4	3.95	0.0997	0.04593	0.0662	3.04	2.98
2	4	5.54	0.1597	0.07817	0.0821	6.04	6.24
2	4	5.16	0.1497	0.06896	0.0783	5.40	5.34
2	4	4.78	0.1297	0.05975	0.0745	4.45	4.40
2	4	4.50	0.1097	0.05053	0.0717	3.62	3.56
2	4	4.20	0.0897	0.04593	0.0687	2.84	2.98
3	4	5.56	0.1597	0.07817	0.0823	6.05	6.24
3	4	5.23	0.1497	0.06896	0.0790	5.45	5.34
3	4	4.94	0.1297	0.05514	0.0761	4.54	4.40
3	4	4.60	0.1097	0.05053	0.0727	3.67	3.56
3	4	4.20	0.0897	0.04132	0.0687	2.84	2.98
4	4	5.60	0.1597	0.07817	0.0827	6.08	6.24
4	4	5.25	0.1497	0.06896	0.0792	5.46	5.34
4	4	4.81	0.1297	0.05514	0.0748	4.47	4.40
4	4	4.51	0.1097	0.05053	0.0718	3.03	3.56
4	4	4.38	0.0897	0.04132	0.0705	2.91	2.98

According to the original Sutro Weir equation, the coefficient of discharge ranges from 0.0597 to 0.619.Accurate selection of coefficient of discharge is very crucial in the determination of the validity of the Q-h relationship as suggested by Sutro . Therefore, several values of the coefficient of discharges were tested to see those within the range mentioned that actually gives the theoretical discharge closest to the actual discharge. As can be seen in appendix B (table 4.7a – 4.12e), the coefficient of discharge that gave satisfactory results are within the middle of the range as the lower values and the higher values of C_d gave significant difference between the actual and theoretical discharges. This trend was also noticed in appendix C (table 4.8a – 4.14e). More so, as the values of the rectangular base height (s) increase the difference became more pronounced to the extent that when s = 12 cm, almost all the actual discharges have the same values as shown in table 4.3. For the set 1 models, the C_d ranges from 0.0597 to 0.1697 whereas for the set 2 models its ranges from 0.0897 to 0.1697. Therefore for the practical application of the sutro weir, it is not sufficient to select a particular value of Cd for calculating the discharge.

To obtain the Water Surface profile, depths were measured from the channel bottom for the different discharges at an interval of 50 cm using the Point gauge. The results were used to plot the Water surface profile. The results are presented in Table 4.5 and Figure 4.1

Table 4.5: **Water depths for different discharge conditions**

Distance From weir (cm)	**Water depth from channel bottom (cm)**				
	Q_{1}= 6.24 l/s	**Q_{2}= 5.34 l/s**	**Q_{3}= 4.40 l/s**	**Q_{4}= 3.56 l/s**	**Q_{5}= 2.98 l/s**
600	10.20	9.85	8.87	8.90	7.95
550	10.20	9.85	8.87	8.90	7.90
500	10.20	9.80	8.83	8.90	7.90
450	10.15	9.80	8.83	8.78	7.90
400	10.15	9.80	8.80	8.78	7.90
350	10.10	9.75	8.80	8.62	7.86
300	9.85	8.95	7.86	7.82	6.95
250	9.80	8.90	7.82	7.78	6.90
200	9.76	8.85	7.82	7.73	6.85
150	9.72	8.85	7.78	7.70	6.85
100	9.70	8.81	7.74	7.70	6.80
50	9.70	8.80	7.74	7.65	6.80

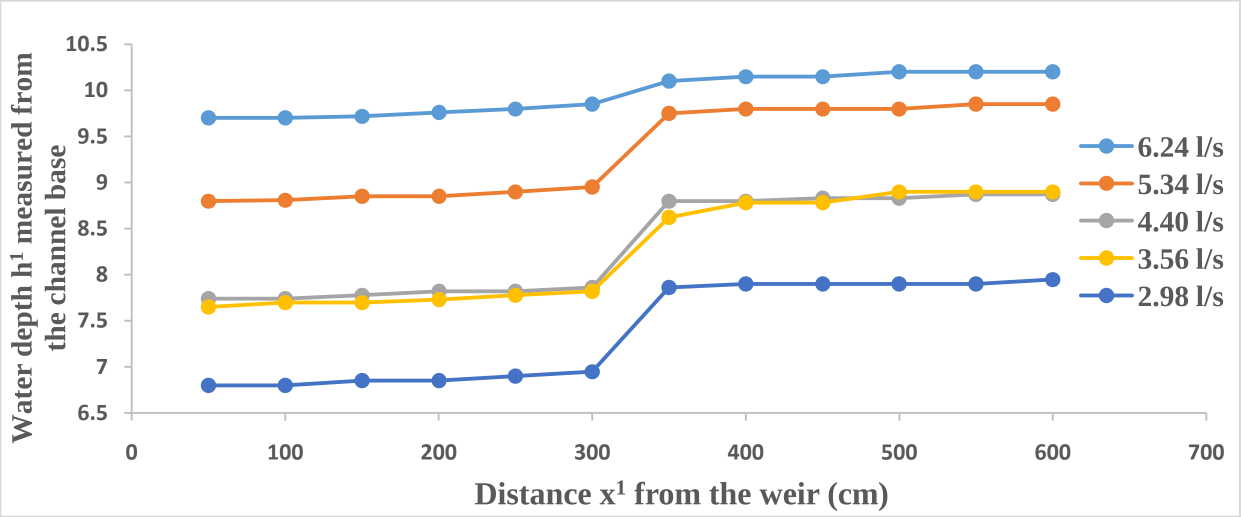


Figure 4.1: Water surface profiles of sutro weir model

It is observed from the figure 4.1 that beyond a distance of 250cm from the weir the water surface is almost constant. Therefore, the point gauge was located at 300 cm upstream from the weir to obtain the head (h_d) measured above the weir crest.

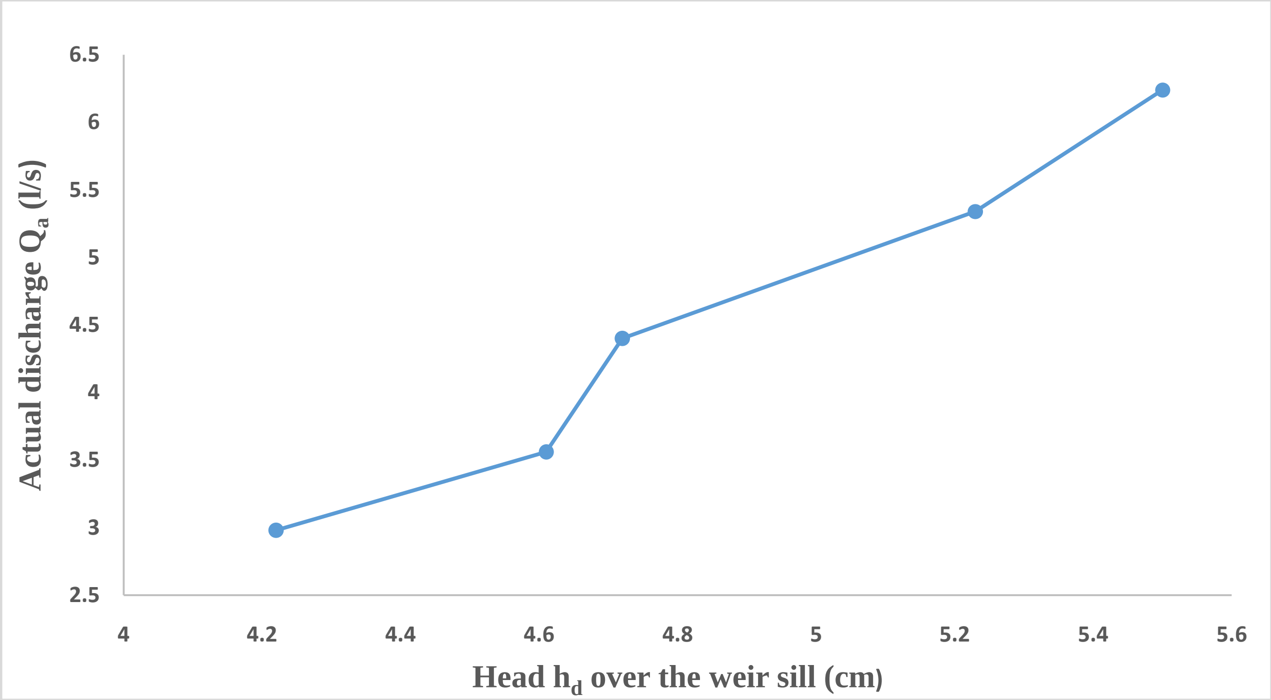


Figure 4.2a: Variation of Q_a with h_d (M11)

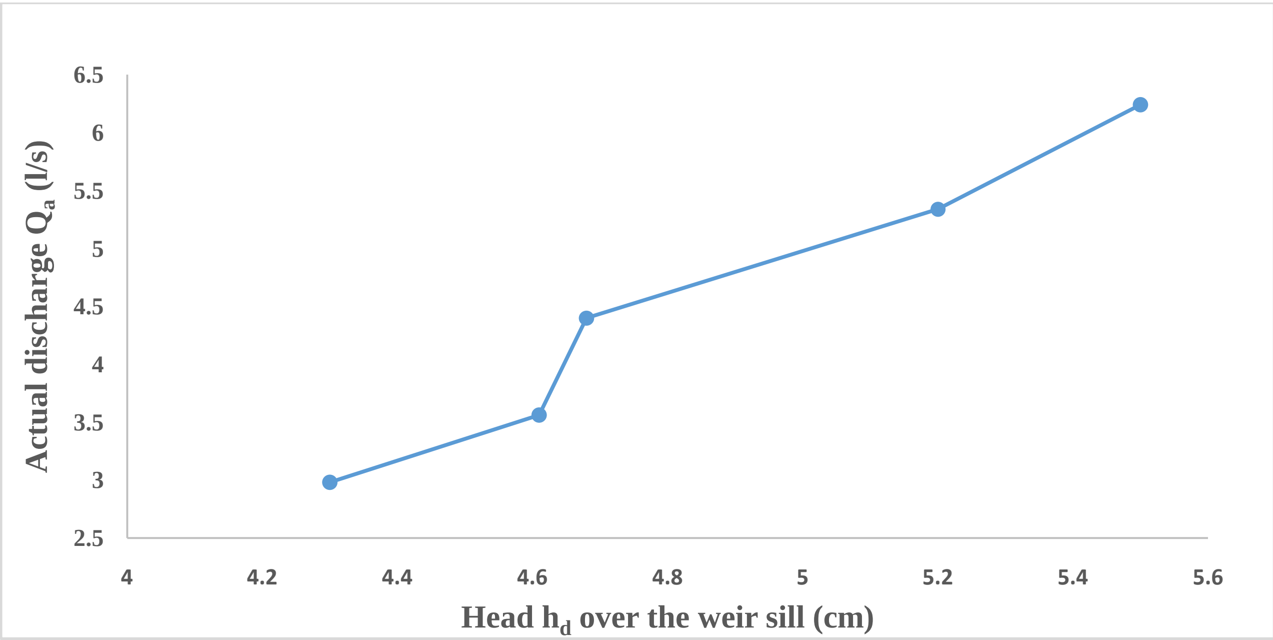


Figure 4.2b: Variation of Q_a with h_d (M12)

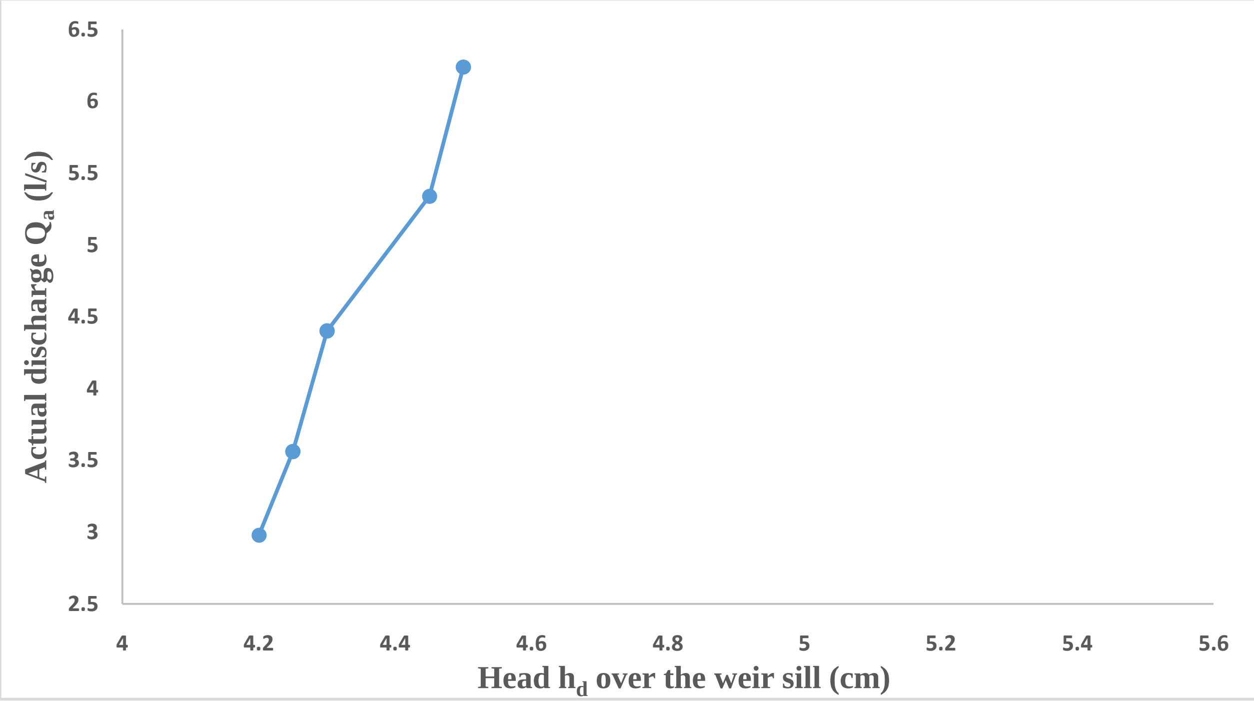


Figure 4.2c: Variation of Q_a with h_d (M13)

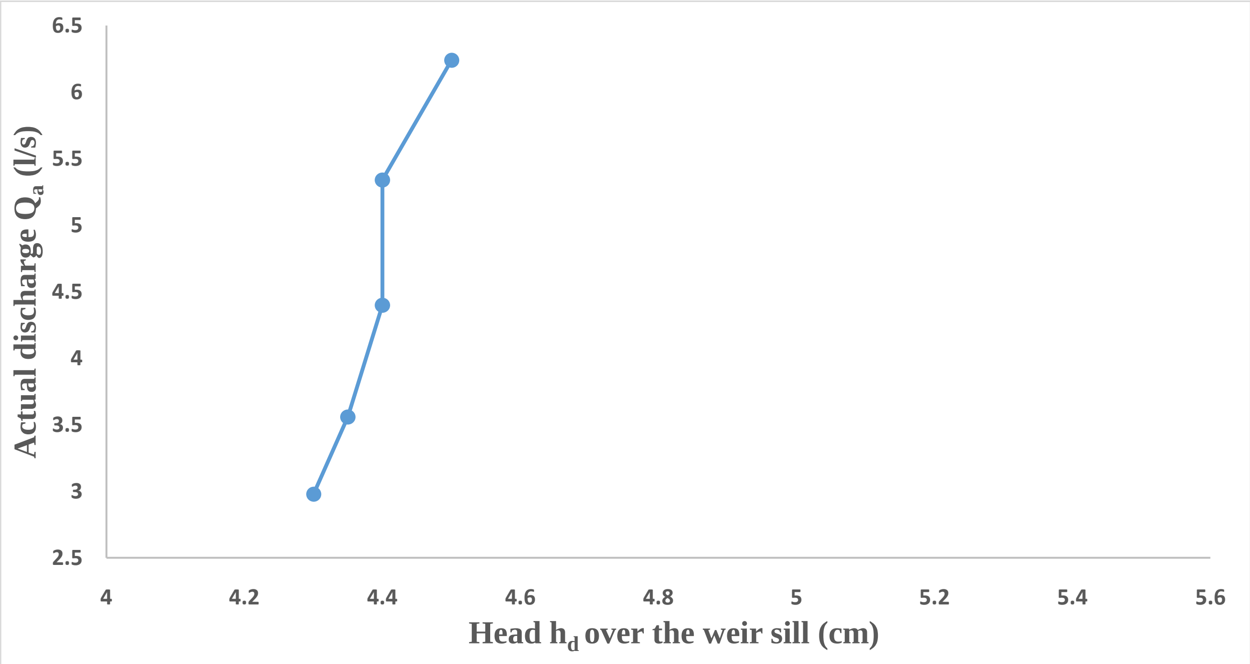


Figure 4.2d: Variation of Q_a with h_d (M14)

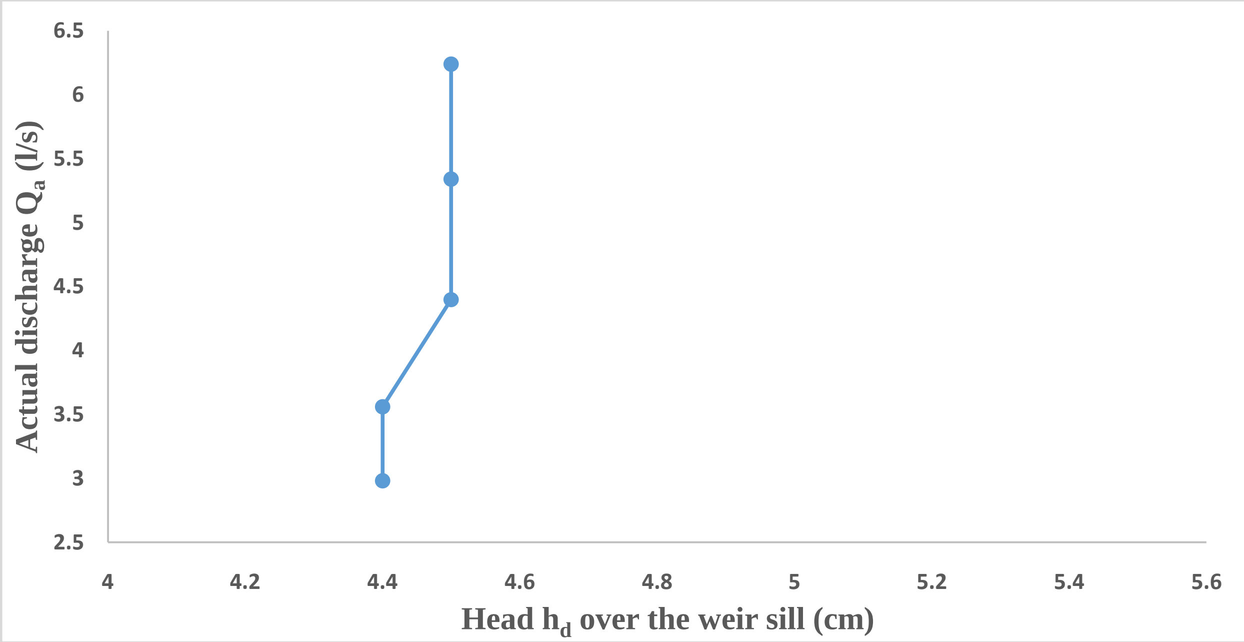


Figure 4.2e: Variation of Q_a with h_d (M15)

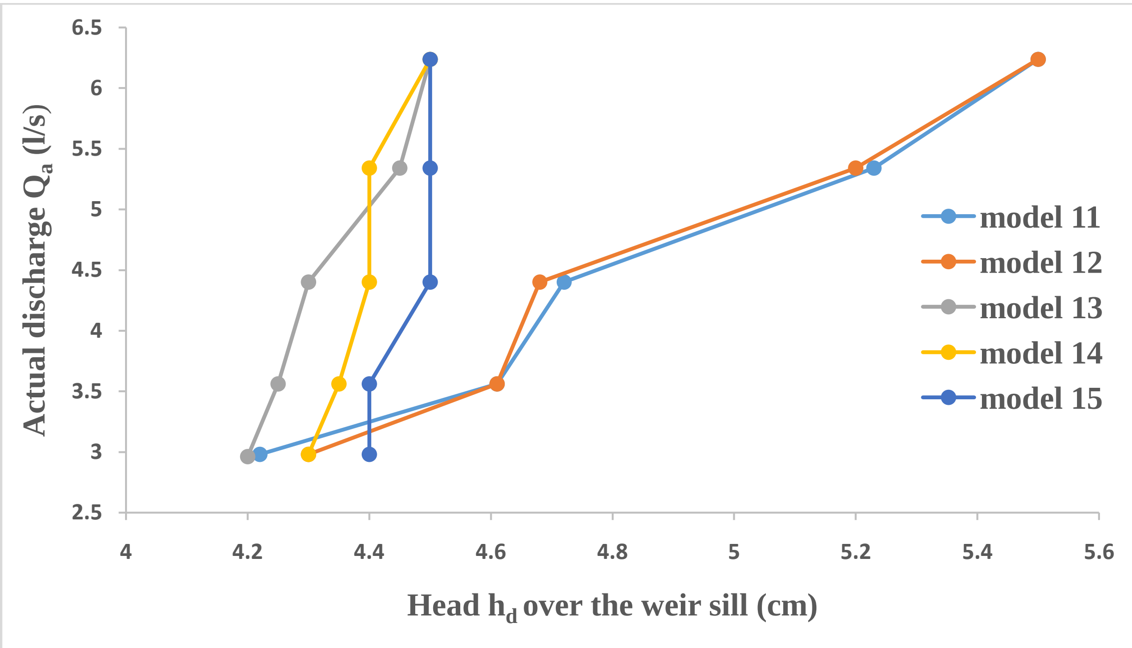


Figure 4.2f: Variation of Q_a with h_d (Set 1 combined)

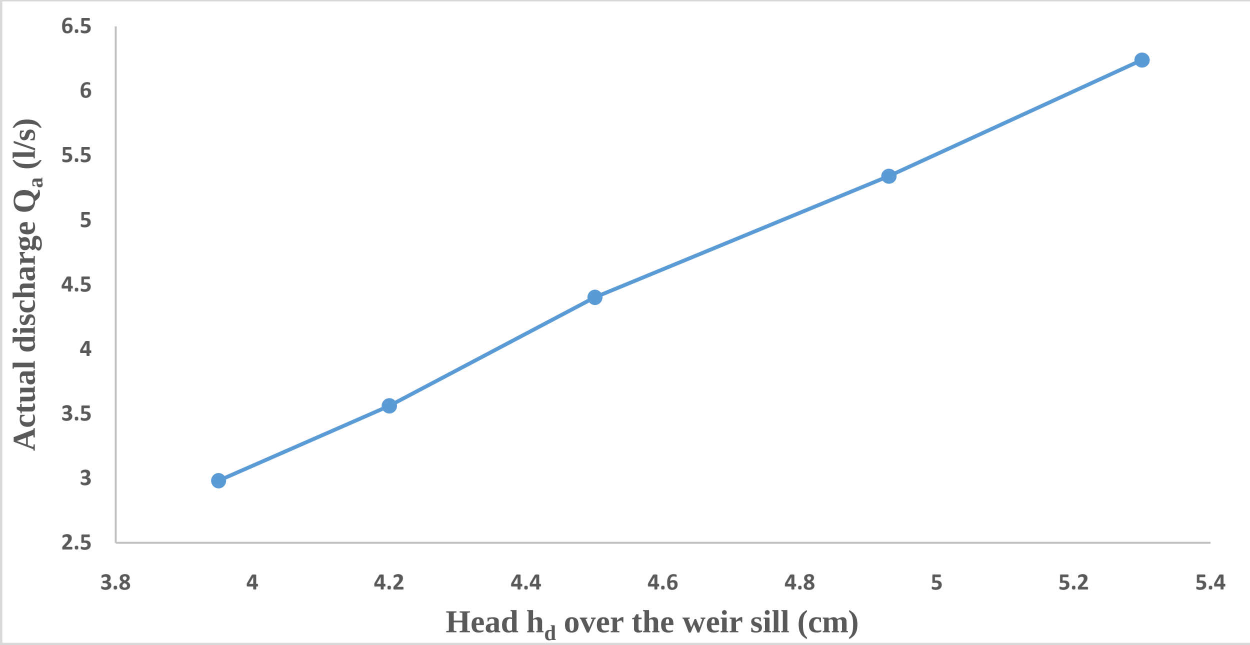


Figure 4.3a: Variation of Q_a with h_d (M21)

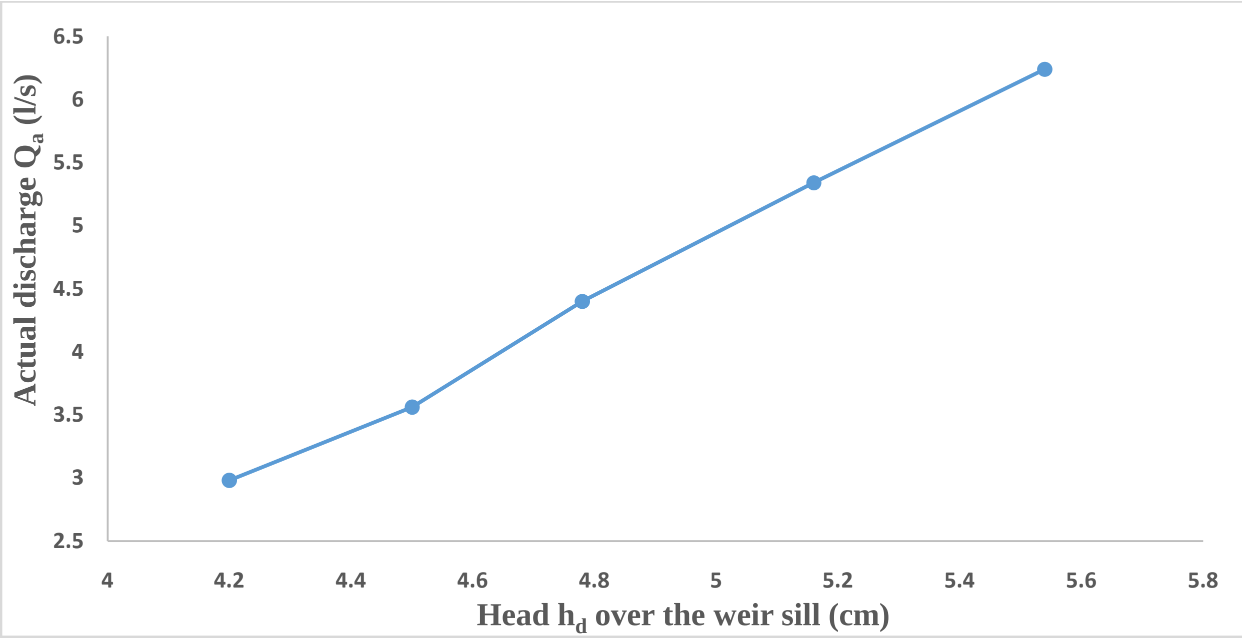


Figure 4.3b: Variation of Q_a with h_d (M22)

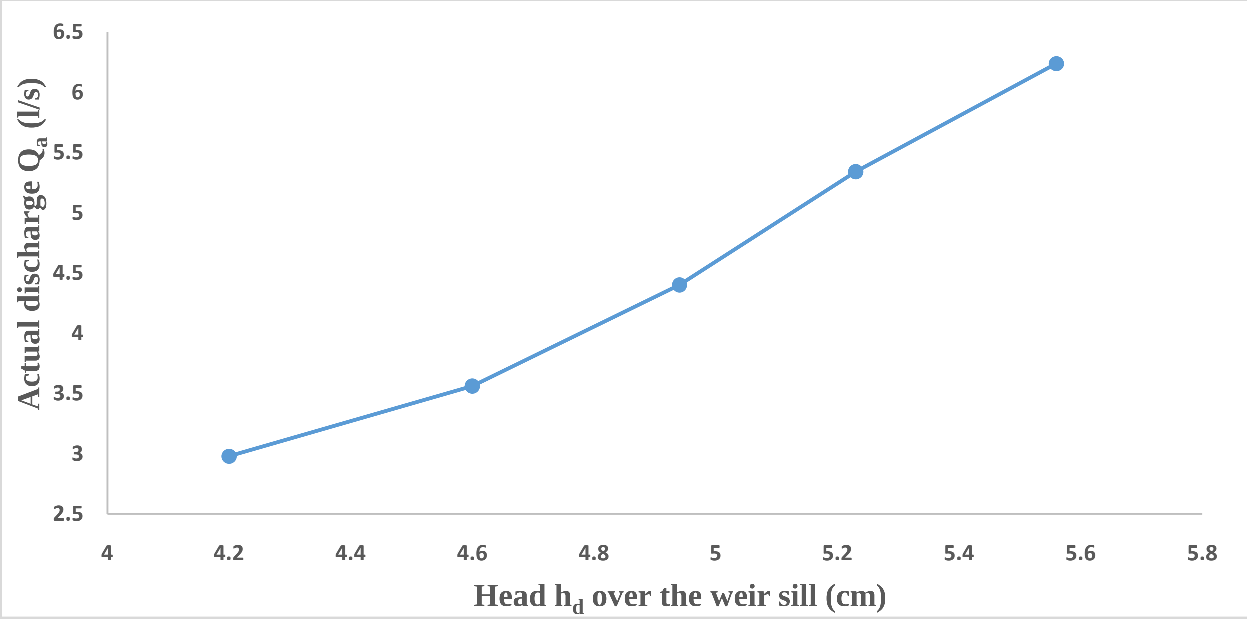


Figure 4.3c: Variation of Q_a with h_d (M23)

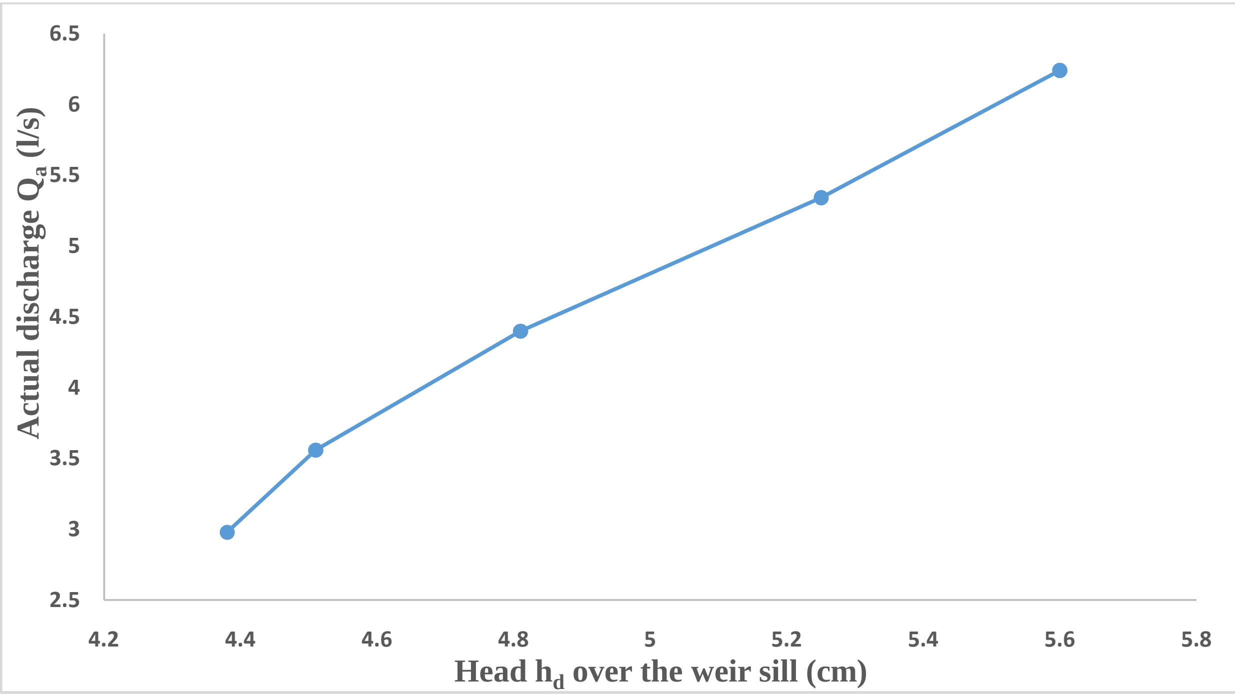


Figure 4.3d: Variation of Q_a with h_d (M24)

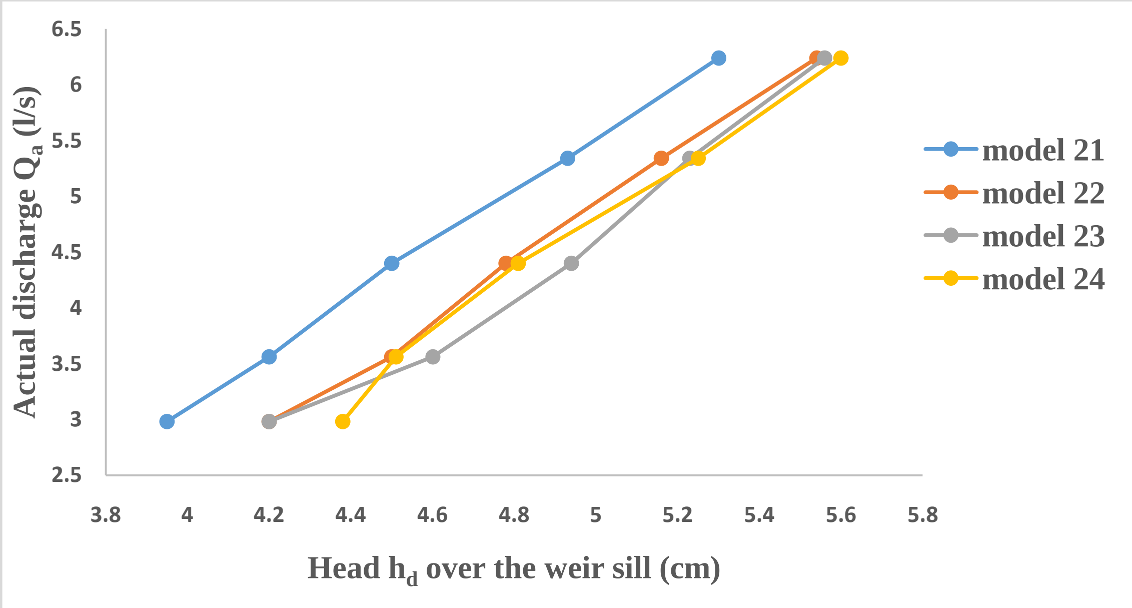


Figure 4.3e: Variation of Q_a with h_d (Set 2 combined)

Figures 4.2a – 4.2e were obtained by plotting the actual discharges against the heads measured by the set 1 model as shown in table 4.1. Figure 4.2f showed the combined graph for the set 1 model. The figures showed that the set 1 model did not actually indicate a linear relationship between the Q and the h. However, figures 4.3a – 4.3d plotted from table 4.2 showed a better linear relationship between the discharges and the head measured above the weir crest. Figure 4.3e showed the combined graph for the set 2 model.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

This research work titled laboratory investigation of flow characteristics of a sutro weir aimed at investigating the flow characteristics of a sutro weir was successfully carried out in the hydraulic laboratory of the Department of Water Resources and Environmental Engineering, Ahmadu Bello University, Zaria .The experiments were conducted in a rectangular flume of length 6m with a cross section of 0.3m wide and 0.3m deep. Nine different models made of wood were fabricated. The models were divided into two sets 1 and 2. The set1 model consists of five different models of constant radius (R) of 9cm while the set 2 model consists of four different models of constant rectangular base height (s) of 4cm.The models were placed in turn in the flume and water was allowed to circulate through it. The height of water above the weir crest (h_d) was taken and the time taken to collect 20kg of water in the receiving basin. The results obtained were presented in tables and graphs. Analysis of the results showed that the set 2 model showed better linear relationship between the discharge and the head measured above the weir crest compared to the set 1 model. It was also observed that no particular value of the coefficient of discharge within the range 0.0597 to 0.619 gave me the theoretical discharge equal to the actual discharge using the original weir equation given by Sutro.

5.2 Conclusion

In this research thesis, the discharge characteristics of a Sutro Weir have been investigated. From the results obtained and carefully analysed, the following conclusions were drawn.

1. Both sets of models showed that the coefficient of discharges (C_d) decrease with decreasing heads(h_d).
2. The set 2 models with varying curve radius, R, showed significant effect on the head measured above the crest compared with the set 1 model.
3. The set2 models showed a better linear relationship between the actual discharges and the head measured above the weir crest.
4. There was no particular value of coefficient of discharge within the range of 0.0597 to 0.619 gave the theoretical discharge equal to the actual discharge using the original weir equation by Sutro.

5.3 Recommendation

Having carried out the experiment on the laboratory investigations of the discharge characteristics of a sutro weir within an acceptable experimental error and the results carefully analysed, the following recommendations may be considered for further studies in this research topic.

1. Low discharges ranging between 2.98 l/s to 6.24 l/s wereconsidered; therefore I recommend for further studies higher values of discharges to ascertain the claim by Doebler and Rayfield (1973) that C_d for sutro weir has the tendency to decrease at low heads up to a certain minimum value and then increases.
2. The use of digital measuring instrument will greatly enhanced better results.

3. The models used were made of wood; a different material such as steel could be used to see if the thickness will have any significant effect on the discharge.
4. This type of weir is recommended for use as a control outlet for float-regulated devices, as a measuring device in hydraulics and irrigation and as outlet for grit chambers in Environmental Engineering.
5. The ability of the weir to withstand field conditions was not studied therefore I recommend for further studies the determination of the strength of the weir as regard its practicability.
6. For practical application of the Sutro weir it is therefore recommended that instead of using particular value of Cd the whole situation has to be modelled.

REFERENCES

Allen, G.S. and Dalton S.H. (2002). *Weirs for open-channel flow measurement*. Institute of Food and Agriculture Sciences, University of Florida, USA, 323-325.

Arora K.R. (2005). *Fluid mechanics, hydraulics and hydraulic machines*. Standard publishing distributors, Nai Sarak, Dehli, India, 287-298.

Baddour, R.E. (2008). Head- Discharge equation for sharp-crested polynomial weir. *Journal of Irrigation and Drainage Engineering,* 135(3), 395-396.

Boiten, W. (1993). *Flow measuring structures.* Delf Hydraulics, Wageningen Agricultural University, NieuweKanal, Wageningen, the Netherlands, 25-38.

Doebler, M. and Rayfield J. (1973).Sutro weir. *Journal of the Hydraulic Division,* 98(1), 1-10.

Franzini J.B. and Finnemore E.J. (1997). *Fluid Mechanics with Engineering Applications.* Mc- Graw Hill Company Inc., London, England, 212-224.

Gertrudys, B. (2006). *Flow measurement devices*, Division of Water Rights, 87-95.

Keshava, M. and Giridhar D. (1989). Inverted V-Notch: Practical proportional weir, *Journal of Irrigation and Drainage Engineering*, 115(6), 455-463.

Keshava M. and Giridhar D. (1991). Geometrically simple linear weirs using circular quadrant – bell mouth weirs. *Journal of Hydraulic research*, 29(4), 497-509.

Keshava, M. and Seshagiri N. (1968). A generalized mathematical theory and experimental verification of proportional notches, *Journal of Franklin Institute, philadephia, USA*, 285, 347-363.

Lakshmana, R. and Abdul B. (1971). Linear Proportional Weirs with Trapezoidal Bottoms, *Journal of Hydraulic Research*, 9(3), 413-427.

Leonard J. (1975). Linear proportional weirs. Dissertation to faculty of Engineering, Concordia University, Montreal Canada.

Novac (2000). Models in Hydraulic Engineering. Pitman Publishing Inc., London, UK,125-128.

Pratt, E.A (1914). Proportional weir: Sutro weir. *Engineering News Record*, 72(9), 462-463.

Rajput R.K. (2006). *Atextbook of fluid mechanics and hydraulic machines*. S.chand and company limited, Ram Nagar, New Dehli, India, 498-518.

Rasool, G. and Ensiyeh M. (2012). Modified theoretical stage-discharge relation for circular sharp-crested weirs, *Water Sciences and Engineering Journal*, 5(1), 26-33.

Stout, C. (1897). A new form of weir notch, *Transactions of the Nebraska Engineering Society, USA*, 1, 13.

Subramanya, K. (1986). *Flow in open channels*. McGraw-Hill Publishing Company Limited, London, England, 358-363.

Vatankhah, A. and Kouchak, Z. (2009). Head- Discharge equation for sharp-crested polynomial weir. *Journal of Irrigation and Drainage Engineering*, 135(3), 393-396.

APPENDIX A

Table A1: Measured and calculated flow parameters for set 1 models

mass (kg)	t1(s)	t2 (s)	t_{av} (s)	x (cm)	R(cm)	s (cm)	h_d (cm)	Q_a(l/s)
20	3.25	3.17	3.21	8	9	4	5.5	6.24
20	3.7	3.8	3.75	8	9	4	5.23	5.34
20	4.58	4.52	4.55	8	9	4	4.72	4.4
20	5.61	5.63	5.62	8	9	4	4.61	3.56
20	6.68	6.74	6.71	8	9	4	4.22	2.98
20	3.22	3.2	3.21	8	9	6	5.50	6.24
20	3.76	3.74	3.75	8	9	6	5.20	5.34
20	4.56	4.54	4.55	8	9	6	4.68	4.4
20	5.62	5.62	5.62	8	9	6	4.61	3.56
20	6.7	6.72	6.71	8	9	6	4.30	2.98
20	3.23	3.19	3.21	8	9	8	4.50	6.24
20	3.72	3.78	3.75	8	9	8	4.45	5.34
20	4.55	4.55	4.55	8	9	8	4.30	4.4
20	5.62	5.62	5.62	8	9	8	4.25	3.56
20	6.7	6.72	6.71	8	9	8	4.20	2.98
20	3.26	3.16	3.21	8	9	10	4.50	6.24
20	3.75	3.75	3.75	8	9	10	4.40	5.34
20	4.53	4.57	4.55	8	9	10	4.40	4.4
20	5.65	5.59	5.62	8	9	10	4.35	3.56
20	6.74	6.68	6.71	8	9	10	4.30	2.98
20	3.28	3.14	3.21	8	9	12	4.50	6.24
20	3.77	3.73	3.75	8	9	12	4.50	5.34
20	4.57	4.53	4.55	8	9	12	4.50	4.4
20	5.59	5.65	5.62	8	9	12	4.40	3.56
20	6.72	6.7	6.71	8	9	12	4.40	2.98

Table A2: Measured heads for set 1 models

Qa(l/s)	h_{d1}(cm)	h_{d2}(cm)	h_{d3}(cm)	h_{d4}(cm)	h_{d5}(cm)
6.24	5.50	5.50	4.50	4.50	4.50
5.34	5.23	5.20	4.45	4.40	4.50
4.40	4.72	4.68	4.30	4.40	4.50
3.56	4.61	4.61	4.25	4.35	4.40
2.98	4.22	4.30	4.20	4.30	4.40

Table A3: Measured and calculated flow parameters for set 2 models

mass (kg)	t1(s)	t2 (s)	t_{av} (s)	x (cm)	R(cm)	s (cm)	h_d (cm)	Q_a (l/s)
20	3.18	3.24	3.21	4	11	4	5.30	6.24
20	3.72	3.78	3.75	4	11	4	4.93	5.34
20	4.60	4.50	4.55	4	11	4	4.50	4.40
20	5.66	5.58	5.62	4	11	4	4.20	3.56
20	6.70	6.72	6.71	4	11	4	3.95	2.98
20	3.20	3.22	3.21	6	10	4	5.54	6.24
20	3.77	3.73	3.75	6	10	4	5.16	5.34
20	4.64	4.46	4.55	6	10	4	4.78	4.40
20	5.63	5.61	5.62	6	10	4	4.50	3.56
20	6.71	6.71	6.71	6	10	4	4.20	2.98
20	3.23	3.19	3.21	8	9	4	5.56	6.24
20	3.75	3.75	3.75	8	9	4	5.23	5.34
20	4.49	4.61	4.55	8	9	4	4.94	4.40
20	5.62	5.62	5.62	8	9	4	4.60	3.56
20	6.68	6.74	6.71	8	9	4	4.20	2.98
20	3.24	3.18	3.21	10	8	4	5.60	6.24
20	3.73	3.77	3.75	10	8	4	5.25	5.34
20	4.58	4.52	4.55	10	8	4	4.81	4.40
20	5.64	5.60	5.62	10	8	4	4.51	3.56
20	6.70	6.72	6.71	10	8	4	4.38	2.98

Table A4: Measured heads for set 2 models

Q_a(l/s)	h_{d1}(cm)	h_{d2}(cm)	h_{d3}(cm)	h_{d4}(cm)
6.24	5.30	5.54	5.56	5.60
5.34	4.93	5.16	5.23	5.25
4.40	4.50	4.78	4.94	4.81
3.56	4.20	4.50	4.60	4.51
2.98	3.95	4.20	4.20	4.38

APPENDIX B

Table B1: Range of Cd for set 1 model (Type 1a, Q = 6.24 l/s)

s (cm)	h (cm)	C_d	m	Co	x	Q_t (l/s)	% Error
4	5.5	0.0597	0.4607	0.0275	0.0817	2.25	64.01
4	5.5	0.0697	0.4607	0.0321	0.0817	2.62	57.98
4	5.5	0.0797	0.4607	0.0367	0.0817	3.00	51.95
4	5.5	0.0897	0.4607	0.0413	0.0817	3.37	45.92
4	5.5	0.0997	0.4607	0.0459	0.0817	3.75	39.89
4	5.5	0.1097	0.4607	0.0505	0.0817	4.13	33.86
4	5.5	0.1197	0.4607	0.0551	0.0817	4.50	27.83
4	5.5	0.1297	0.4607	0.0597	0.0817	4.88	21.80
4	5.5	0.1397	0.4607	0.0644	0.0817	5.26	15.78
4	5.5	0.1497	0.4607	0.0690	0.0817	5.63	9.75
4	5.5	0.1597	0.4607	0.0736	0.0817	6.01	3.72
4	5.5	0.1697	0.4607	0.0782	0.0817	**6.38**	**-2.31**
4	5.5	0.1797	0.4607	0.0828	0.0817	6.76	-8.34
4	5.5	0.1897	0.4607	0.0874	0.0817	7.14	-14.37
4	5.5	0.1997	0.4607	0.0920	0.0817	7.51	-20.40
4	5.5	0.2097	0.4607	0.0966	0.0817	7.89	-26.43
4	5.5	0.2197	0.4607	0.1012	0.0817	8.27	-32.46
4	5.5	0.2297	0.4607	0.1058	0.0817	8.64	-38.49
4	5.5	0.2397	0.4607	0.1104	0.0817	9.02	-44.51
4	5.5	0.2497	0.4607	0.1150	0.0817	9.39	-50.54
4	5.5	0.2597	0.4607	0.1196	0.0817	9.77	-56.57
4	5.5	0.2697	0.4607	0.1242	0.0817	10.15	-62.60
4	5.5	0.2797	0.4607	0.1288	0.0817	10.52	-68.63
4	5.5	0.2897	0.4607	0.1335	0.0817	10.90	-74.66
4	5.5	0.2997	0.4607	0.1381	0.0817	11.27	-80.69
4	5.5	0.3097	0.4607	0.1427	0.0817	11.65	-86.72
4	5.5	0.3197	0.4607	0.1473	0.0817	12.03	-92.75
4	5.5	0.3297	0.4607	0.1519	0.0817	12.40	-98.78
4	5.5	0.3397	0.4607	0.1565	0.0817	12.78	-104.80
4	5.5	0.3497	0.4607	0.1611	0.0817	13.16	-110.83
4	5.5	0.3597	0.4607	0.1657	0.0817	13.53	-116.86
4	5.5	0.3697	0.4607	0.1703	0.0817	13.91	-122.89
4	5.5	0.3797	0.4607	0.1749	0.0817	14.28	-128.92
4	5.5	0.3897	0.4607	0.1795	0.0817	14.66	-134.95
4	5.5	0.3997	0.4607	0.1841	0.0817	15.04	-140.98
4	5.5	0.4097	0.4607	0.1887	0.0817	15.41	-147.01
4	5.5	0.4197	0.4607	0.1933	0.0817	15.79	-153.04
4	5.5	0.4297	0.4607	0.1979	0.0817	16.17	-159.06
4	5.5	0.4397	0.4607	0.2026	0.0817	16.54	-165.09
4	5.5	0.4497	0.4607	0.2072	0.0817	16.92	-171.12

4	5.5	0.4597	0.4607	0.2118	0.0817	17.29	-177.15
4	5.5	0.4697	0.4607	0.2164	0.0817	17.67	-183.18
4	5.5	0.4797	0.4607	0.2210	0.0817	18.05	-189.21
4	5.5	0.4897	0.4607	0.2256	0.0817	18.42	-195.24
4	5.5	0.4997	0.4607	0.2302	0.0817	18.80	-201.27
4	5.5	0.5097	0.4607	0.2348	0.0817	19.18	-207.30
4	5.5	0.5197	0.4607	0.2394	0.0817	19.55	-213.33
4	5.5	0.5297	0.4607	0.2440	0.0817	19.93	-219.35
4	5.5	0.5397	0.4607	0.2486	0.0817	20.30	-225.38
4	5.5	0.5497	0.4607	0.2532	0.0817	20.68	-231.41
4	5.5	0.5597	0.4607	0.2578	0.0817	21.06	-237.44
4	5.5	0.5697	0.4607	0.2624	0.0817	21.43	-243.47
4	5.5	0.5797	0.4607	0.2670	0.0817	21.81	-249.50
4	5.5	0.5897	0.4607	0.2717	0.0817	22.18	-255.53
4	5.5	0.5997	0.4607	0.2763	0.0817	22.56	-261.56
4	5.5	0.6097	0.4607	0.2809	0.0817	22.94	-267.59
4	5.5	0.6197	0.4607	0.2855	0.0817	23.31	-273.62

Table B2: Range of C_d for set 1 model (Type 1b, Q = 5.34 l/s)

s (cm)	h (cm)	Cd	M	Co	x	Qt (l/s)	% Error
4	5.23	0.0597	0.4607	0.0275	0.0790	2.17	59.33
4	5.23	0.0697	0.460662	0.0321	0.0790	2.54	52.52
4	5.23	0.0797	0.460662	0.0367	0.0790	2.90	45.71
4	5.23	0.0897	0.460662	0.0413	0.0790	3.26	38.89
4	5.23	0.0997	0.460662	0.0459	0.0790	3.63	32.08
4	5.23	0.1097	0.460662	0.0505	0.0790	3.99	25.27
4	5.23	0.1197	0.460662	0.0551	0.0790	4.35	18.46
4	5.23	0.1297	0.460662	0.0597	0.0790	4.72	11.65
4	5.23	0.1397	0.460662	0.0644	0.0790	5.08	4.83
4	5.23	0.1497	0.460662	0.0690	0.0790	**5.45**	**-1.98**
4	5.23	0.1597	0.460662	0.0736	0.0790	5.81	-8.79
4	5.23	0.1697	0.460662	0.0782	0.0790	6.17	-15.60
4	5.23	0.1797	0.460662	0.0828	0.0790	6.54	-22.41
4	5.23	0.1897	0.460662	0.0874	0.0790	6.90	-29.23
4	5.23	0.1997	0.460662	0.0920	0.0790	7.26	-36.04
4	5.23	0.2097	0.460662	0.0966	0.0790	7.63	-42.85
4	5.23	0.2197	0.460662	0.1012	0.0790	7.99	-49.66
4	5.23	0.2297	0.460662	0.1058	0.0790	8.36	-56.48
4	5.23	0.2397	0.460662	0.1104	0.0790	8.72	-63.29
4	5.23	0.2497	0.460662	0.1150	0.0790	9.08	-70.10
4	5.23	0.2597	0.460662	0.1196	0.0790	9.45	-76.91
4	5.23	0.2697	0.460662	0.1242	0.0790	9.81	-83.72
4	5.23	0.2797	0.460662	0.1288	0.0790	10.17	-90.54

4	5.23	0.2897	0.460662	0.1335	0.0790	10.54	-97.35
4	5.23	0.2997	0.460662	0.1381	0.0790	10.90	-104.16
4	5.23	0.3097	0.460662	0.1427	0.0790	11.27	-110.97
4	5.23	0.3197	0.460662	0.1473	0.0790	11.63	-117.79
4	5.23	0.3297	0.460662	0.1519	0.0790	11.99	-124.60
4	5.23	0.3397	0.460662	0.1565	0.0790	12.36	-131.41
4	5.23	0.3497	0.460662	0.1611	0.0790	12.72	-138.22
4	5.23	0.3597	0.460662	0.1657	0.0790	13.08	-145.03
4	5.23	0.3697	0.460662	0.1703	0.0790	13.45	-151.85
4	5.23	0.3797	0.460662	0.1749	0.0790	13.81	-158.66
4	5.23	0.3897	0.460662	0.1795	0.0790	14.18	-165.47
4	5.23	0.3997	0.460662	0.1841	0.0790	14.54	-172.28
4	5.23	0.4097	0.460662	0.1887	0.0790	14.90	-179.09
4	5.23	0.4197	0.460662	0.1933	0.0790	15.27	-185.91
4	5.23	0.4297	0.460662	0.1979	0.0790	15.63	-192.72
4	5.23	0.4397	0.460662	0.2026	0.0790	15.99	-199.53
4	5.23	0.4497	0.460662	0.2072	0.0790	16.36	-206.34
4	5.23	0.4597	0.460662	0.2118	0.0790	16.72	-213.16
4	5.23	0.4697	0.460662	0.2164	0.0790	17.09	-219.97
4	5.23	0.4797	0.460662	0.2210	0.0790	17.45	-226.78
4	5.23	0.4897	0.460662	0.2256	0.0790	17.81	-233.59
4	5.23	0.4997	0.460662	0.2302	0.0790	18.18	-240.40
4	5.23	0.5097	0.460662	0.2348	0.0790	18.54	-247.22
4	5.23	0.5197	0.460662	0.2394	0.0790	18.91	-254.03
4	5.23	0.5297	0.460662	0.2440	0.0790	19.27	-260.84
4	5.23	0.5397	0.460662	0.2486	0.0790	19.63	-267.65
4	5.23	0.5497	0.460662	0.2532	0.0790	20.00	-274.46
4	5.23	0.5597	0.460662	0.2578	0.0790	20.36	-281.28
4	5.23	0.5697	0.460662	0.2624	0.0790	20.72	-288.09
4	5.23	0.5797	0.460662	0.2670	0.0790	21.09	-294.90
4	5.23	0.5897	0.460662	0.2717	0.0790	21.45	-301.71
4	5.23	0.5997	0.460662	0.2763	0.0790	21.82	-308.53
4	5.23	0.6097	0.460662	0.2809	0.0790	22.18	-315.34
4	5.23	0.6197	0.460662	0.2855	0.0790	22.54	-322.15

Table B3: Range of C_d for set 1 model (Type 1c, Q = 4.40 l/s)

s (cm)	h (cm)	Cd	M	Co	x	Qt (l/s)	% Error
4	4.72	0.0597	0.4607	0.0275	0.0739	2.03	53.83
4	4.72	0.0697	0.4607	0.0321	0.0739	2.37	46.10
4	4.72	0.0797	0.4607	0.0367	0.0739	2.71	38.36
4	4.72	0.0897	0.4607	0.0413	0.0739	3.05	30.63
4	4.72	0.0997	0.4607	0.0459	0.0739	3.39	22.90
4	4.72	0.1097	0.4607	0.0505	0.0739	3.73	15.16
4	4.72	0.1197	0.4607	0.0551	0.0739	4.07	7.43
4	4.72	0.1297	0.4607	0.0597	0.0739	**4.41**	**-0.30**
4	4.72	0.1397	0.4607	0.0644	0.0739	4.75	-8.04
4	4.72	0.1497	0.4607	0.0690	0.0739	5.09	-15.77
4	4.72	0.1597	0.4607	0.0736	0.0739	5.43	-23.50
4	4.72	0.1697	0.4607	0.0782	0.0739	5.77	-31.24
4	4.72	0.1797	0.4607	0.0828	0.0739	6.11	-38.97
4	4.72	0.1897	0.4607	0.0874	0.0739	6.46	-46.71
4	4.72	0.1997	0.4607	0.0920	0.0739	6.80	-54.44
4	4.72	0.2097	0.4607	0.0966	0.0739	7.14	-62.17
4	4.72	0.2197	0.4607	0.1012	0.0739	7.48	-69.91
4	4.72	0.2297	0.4607	0.1058	0.0739	7.82	-77.64
4	4.72	0.2397	0.4607	0.1104	0.0739	8.16	-85.37
4	4.72	0.2497	0.4607	0.1150	0.0739	8.50	-93.11
4	4.72	0.2597	0.4607	0.1196	0.0739	8.84	-100.84
4	4.72	0.2697	0.4607	0.1242	0.0739	9.18	-108.57
4	4.72	0.2797	0.4607	0.1288	0.0739	9.52	-116.31
4	4.72	0.2897	0.4607	0.1335	0.0739	9.86	-124.04
4	4.72	0.2997	0.4607	0.1381	0.0739	10.20	-131.77
4	4.72	0.3097	0.4607	0.1427	0.0739	10.54	-139.51
4	4.72	0.3197	0.4607	0.1473	0.0739	10.88	-147.24
4	4.72	0.3297	0.4607	0.1519	0.0739	11.22	-154.98
4	4.72	0.3397	0.4607	0.1565	0.0739	11.56	-162.71
4	4.72	0.3497	0.4607	0.1611	0.0739	11.90	-170.44
4	4.72	0.3597	0.4607	0.1657	0.0739	12.24	-178.18
4	4.72	0.3697	0.4607	0.1703	0.0739	12.58	-185.91
4	4.72	0.3797	0.4607	0.1749	0.0739	12.92	-193.64
4	4.72	0.3897	0.4607	0.1795	0.0739	13.26	-201.38
4	4.72	0.3997	0.4607	0.1841	0.0739	13.60	-209.11
4	4.72	0.4097	0.4607	0.1887	0.0739	13.94	-216.84
4	4.72	0.4197	0.4607	0.1933	0.0739	14.28	-224.58
4	4.72	0.4297	0.4607	0.1979	0.0739	14.62	-232.31
4	4.72	0.4397	0.4607	0.2026	0.0739	14.96	-240.04
4	4.72	0.4497	0.4607	0.2072	0.0739	15.30	-247.78
4	4.72	0.4597	0.4607	0.2118	0.0739	15.64	-255.51
4	4.72	0.4697	0.4607	0.2164	0.0739	15.98	-263.24
4	4.72	0.4797	0.4607	0.2210	0.0739	16.32	-270.98

4	4.72	0.4897	0.4607	0.2256	0.0739	16.66	-278.71
4	4.72	0.4997	0.4607	0.2302	0.0739	17.00	-286.45
4	4.72	0.5097	0.4607	0.2348	0.0739	17.34	-294.18
4	4.72	0.5197	0.4607	0.2394	0.0739	17.68	-301.91
4	4.72	0.5297	0.4607	0.2440	0.0739	18.02	-309.65
4	4.72	0.5397	0.4607	0.2486	0.0739	18.36	-317.38
4	4.72	0.5497	0.4607	0.2532	0.0739	18.70	-325.11
4	4.72	0.5597	0.4607	0.2578	0.0739	19.05	-332.85
4	4.72	0.5697	0.4607	0.2624	0.0739	19.39	-340.58
4	4.72	0.5797	0.4607	0.2670	0.0739	19.73	-348.31
4	4.72	0.5897	0.4607	0.2717	0.0739	20.07	-356.05
4	4.72	0.5997	0.4607	0.2763	0.0739	20.41	-363.78
4	4.72	0.6097	0.4607	0.2809	0.0739	20.75	-371.51
4	4.72	0.6197	0.4607	0.2855	0.0739	21.09	-379.25

Table B4: Range of C_d for set 1 model (Type 1d, Q = 3.56 l/s)

s (cm)	h (cm)	Cd	M	Co	x	Qt (l/s)	% Error
4	4.61	0.0597	0.4607	0.0275	0.0728	2.00	43.79
4	4.61	0.0697	0.4607	0.0321	0.0728	2.34	34.37
4	4.61	0.0797	0.4607	0.0367	0.0728	2.67	24.95
4	4.61	0.0897	0.4607	0.0413	0.0728	3.01	15.54
4	4.61	0.0997	0.4607	0.0459	0.0728	3.34	6.12
4	4.61	0.1097	0.4607	0.0505	0.0728	**3.68**	**-3.29**
4	4.61	0.1197	0.4607	0.0551	0.0728	4.01	-12.71
4	4.61	0.1297	0.4607	0.0597	0.0728	4.35	-22.13
4	4.61	0.1397	0.4607	0.0644	0.0728	4.68	-31.54
4	4.61	0.1497	0.4607	0.0690	0.0728	5.02	-40.96
4	4.61	0.1597	0.4607	0.0736	0.0728	5.35	-50.37
4	4.61	0.1697	0.4607	0.0782	0.0728	5.69	-59.79
4	4.61	0.1797	0.4607	0.0828	0.0728	6.02	-69.21
4	4.61	0.1897	0.4607	0.0874	0.0728	6.36	-78.62
4	4.61	0.1997	0.4607	0.0920	0.0728	6.69	-88.04
4	4.61	0.2097	0.4607	0.0966	0.0728	7.03	-97.45
4	4.61	0.2197	0.4607	0.1012	0.0728	7.36	-106.87
4	4.61	0.2297	0.4607	0.1058	0.0728	7.70	-116.28
4	4.61	0.2397	0.4607	0.1104	0.0728	8.03	-125.70
4	4.61	0.2497	0.4607	0.1150	0.0728	8.37	-135.12
4	4.61	0.2597	0.4607	0.1196	0.0728	8.71	-144.53
4	4.61	0.2697	0.4607	0.1242	0.0728	9.04	-153.95
4	4.61	0.2797	0.4607	0.1288	0.0728	9.38	-163.36
4	4.61	0.2897	0.4607	0.1335	0.0728	9.71	-172.78
4	4.61	0.2997	0.4607	0.1381	0.0728	10.05	-182.20
4	4.61	0.3097	0.4607	0.1427	0.0728	10.38	-191.61

4	4.61	0.3197	0.4607	0.1473	0.0728	10.72	-201.03
4	4.61	0.3297	0.4607	0.1519	0.0728	11.05	-210.44
4	4.61	0.3397	0.4607	0.1565	0.0728	11.39	-219.86
4	4.61	0.3497	0.4607	0.1611	0.0728	11.72	-229.28
4	4.61	0.3597	0.4607	0.1657	0.0728	12.06	-238.69
4	4.61	0.3697	0.4607	0.1703	0.0728	12.39	-248.11
4	4.61	0.3797	0.4607	0.1749	0.0728	12.73	-257.52
4	4.61	0.3897	0.4607	0.1795	0.0728	13.06	-266.94
4	4.61	0.3997	0.4607	0.1841	0.0728	13.40	-276.36
4	4.61	0.4097	0.4607	0.1887	0.0728	13.73	-285.77
4	4.61	0.4197	0.4607	0.1933	0.0728	14.07	-295.19
4	4.61	0.4297	0.4607	0.1979	0.0728	14.40	-304.60
4	4.61	0.4397	0.4607	0.2026	0.0728	14.74	-314.02
4	4.61	0.4497	0.4607	0.2072	0.0728	15.07	-323.44
4	4.61	0.4597	0.4607	0.2118	0.0728	15.41	-332.85
4	4.61	0.4697	0.4607	0.2164	0.0728	15.74	-342.27
4	4.61	0.4797	0.4607	0.2210	0.0728	16.08	-351.68
4	4.61	0.4897	0.4607	0.2256	0.0728	16.42	-361.10
4	4.61	0.4997	0.4607	0.2302	0.0728	16.75	-370.52
4	4.61	0.5097	0.4607	0.2348	0.0728	17.09	-379.93
4	4.61	0.5197	0.4607	0.2394	0.0728	17.42	-389.35
4	4.61	0.5297	0.4607	0.2440	0.0728	17.76	-398.76
4	4.61	0.5397	0.4607	0.2486	0.0728	18.09	-408.18
4	4.61	0.5497	0.4607	0.2532	0.0728	18.43	-417.60
4	4.61	0.5597	0.4607	0.2578	0.0728	18.76	-427.01
4	4.61	0.5697	0.4607	0.2624	0.0728	19.10	-436.43
4	4.61	0.5797	0.4607	0.2670	0.0728	19.43	-445.84
4	4.61	0.5897	0.4607	0.2717	0.0728	19.77	-455.26
4	4.61	0.5997	0.4607	0.2763	0.0728	20.10	-464.68
4	4.61	0.6097	0.4607	0.2809	0.0728	20.44	-474.09
4	4.61	0.6197	0.4607	0.2855	0.0728	20.77	-483.51

Table B5: Range of C_d for set 1 model (Type 1e, Q = 2.98 l/s)

s (cm)	h (cm)	Cd	M	Co	x	Qt (l/s)	% Error
4	4.61	0.0597	0.4607	0.0275	0.0728	2.00	32.85
4	4.61	0.0697	0.4607	0.0321	0.0728	2.34	21.60
4	4.61	0.0797	0.4607	0.0367	0.0728	2.67	10.35
4	4.61	0.0897	0.4607	0.0413	0.0728	**3.01**	**-0.90**
4	4.61	0.0997	0.4607	0.0459	0.0728	3.34	-12.15
4	4.61	0.1097	0.4607	0.0505	0.0728	3.68	-23.40
4	4.61	0.1197	0.4607	0.0551	0.0728	4.01	-34.65
4	4.61	0.1297	0.4607	0.0597	0.0728	4.35	-45.89
4	4.61	0.1397	0.4607	0.0644	0.0728	4.68	-57.14
4	4.61	0.1497	0.4607	0.0690	0.0728	5.02	-68.39
4	4.61	0.1597	0.4607	0.0736	0.0728	5.35	-79.64
4	4.61	0.1697	0.4607	0.0782	0.0728	5.69	-90.89
4	4.61	0.1797	0.4607	0.0828	0.0728	6.02	-102.14
4	4.61	0.1897	0.4607	0.0874	0.0728	6.36	-113.39
4	4.61	0.1997	0.4607	0.0920	0.0728	6.69	-124.63
4	4.61	0.2097	0.4607	0.0966	0.0728	7.03	-135.88
4	4.61	0.2197	0.4607	0.1012	0.0728	7.36	-147.13
4	4.61	0.2297	0.4607	0.1058	0.0728	7.70	-158.38
4	4.61	0.2397	0.4607	0.1104	0.0728	8.03	-169.63
4	4.61	0.2497	0.4607	0.1150	0.0728	8.37	-180.88
4	4.61	0.2597	0.4607	0.1196	0.0728	8.71	-192.13
4	4.61	0.2697	0.4607	0.1242	0.0728	9.04	-203.38
4	4.61	0.2797	0.4607	0.1288	0.0728	9.38	-214.62
4	4.61	0.2897	0.4607	0.1335	0.0728	9.71	-225.87
4	4.61	0.2997	0.4607	0.1381	0.0728	10.05	-237.12
4	4.61	0.3097	0.4607	0.1427	0.0728	10.38	-248.37
4	4.61	0.3197	0.4607	0.1473	0.0728	10.72	-259.62
4	4.61	0.3297	0.4607	0.1519	0.0728	11.05	-270.87
4	4.61	0.3397	0.4607	0.1565	0.0728	11.39	-282.12
4	4.61	0.3497	0.4607	0.1611	0.0728	11.72	-293.36
4	4.61	0.3597	0.4607	0.1657	0.0728	12.06	-304.61
4	4.61	0.3697	0.4607	0.1703	0.0728	12.39	-315.86
4	4.61	0.3797	0.4607	0.1749	0.0728	12.73	-327.11
4	4.61	0.3897	0.4607	0.1795	0.0728	13.06	-338.36
4	4.61	0.3997	0.4607	0.1841	0.0728	13.40	-349.61
4	4.61	0.4097	0.4607	0.1887	0.0728	13.73	-360.86
4	4.61	0.4197	0.4607	0.1933	0.0728	14.07	-372.10
4	4.61	0.4297	0.4607	0.1979	0.0728	14.40	-383.35
4	4.61	0.4397	0.4607	0.2026	0.0728	14.74	-394.60
4	4.61	0.4497	0.4607	0.2072	0.0728	15.07	-405.85
4	4.61	0.4597	0.4607	0.2118	0.0728	15.41	-417.10
4	4.61	0.4697	0.4607	0.2164	0.0728	15.74	-428.35
4	4.61	0.4797	0.4607	0.2210	0.0728	16.08	-439.60

4	4.61	0.4897	0.4607	0.2256	0.0728	16.42	-450.84
4	4.61	0.4997	0.4607	0.2302	0.0728	16.75	-462.09
4	4.61	0.5097	0.4607	0.2348	0.0728	17.09	-473.34
4	4.61	0.5197	0.4607	0.2394	0.0728	17.42	-484.59
4	4.61	0.5297	0.4607	0.2440	0.0728	17.76	-495.84
4	4.61	0.5397	0.4607	0.2486	0.0728	18.09	-507.09
4	4.61	0.5497	0.4607	0.2532	0.0728	18.43	-518.34
4	4.61	0.5597	0.4607	0.2578	0.0728	18.76	-529.58
4	4.61	0.5697	0.4607	0.2624	0.0728	19.10	-540.83
4	4.61	0.5797	0.4607	0.2670	0.0728	19.43	-552.08
4	4.61	0.5897	0.4607	0.2717	0.0728	19.77	-563.33
4	4.61	0.5997	0.4607	0.2763	0.0728	20.10	-574.58
4	4.61	0.6097	0.4607	0.2809	0.0728	20.44	-585.83
4	4.61	0.6197	0.4607	0.2855	0.0728	20.77	-597.08

Table B6: Range of C_d for set 1 model (Type 2a, Q = 6.24 l/s)

s (cm)	h (cm)	Cd	M	Co	x	Qt (l/s)	% Error
6	5.5	0.0597	0.5642	0.0337	0.0950	3.20	48.72
6	5.5	0.0697	0.5642	0.0393	0.0950	3.74	40.13
6	5.5	0.0797	0.5642	0.0450	0.0950	4.27	31.54
6	5.5	0.0897	0.5642	0.0506	0.0950	4.81	22.95
6	5.5	0.0997	0.5642	0.0563	0.0950	5.34	14.36
6	5.5	0.1097	0.5642	0.0619	0.0950	5.88	5.77
6	5.5	0.1197	0.5642	0.0675	0.0950	**6.42**	**-2.82**
6	5.5	0.1297	0.5642	0.0732	0.0950	6.95	-11.41
6	5.5	0.1397	0.5642	0.0788	0.0950	7.49	-20.00
6	5.5	0.1497	0.5642	0.0845	0.0950	8.02	-28.58
6	5.5	0.1597	0.5642	0.0901	0.0950	8.56	-37.17
6	5.5	0.1697	0.5642	0.0957	0.0950	9.10	-45.76
6	5.5	0.1797	0.5642	0.1014	0.0950	9.63	-54.35
6	5.5	0.1897	0.5642	0.1070	0.0950	10.17	-62.94
6	5.5	0.1997	0.5642	0.1127	0.0950	10.70	-71.53
6	5.5	0.2097	0.5642	0.1183	0.0950	11.24	-80.12
6	5.5	0.2197	0.5642	0.1240	0.0950	11.78	-88.71
6	5.5	0.2297	0.5642	0.1296	0.0950	12.31	-97.30
6	5.5	0.2397	0.5642	0.1352	0.0950	12.85	-105.89
6	5.5	0.2497	0.5642	0.1409	0.0950	13.38	-114.48
6	5.5	0.2597	0.5642	0.1465	0.0950	13.92	-123.07
6	5.5	0.2697	0.5642	0.1522	0.0950	14.46	-131.66
6	5.5	0.2797	0.5642	0.1578	0.0950	14.99	-140.25
6	5.5	0.2897	0.5642	0.1634	0.0950	15.53	-148.84
6	5.5	0.2997	0.5642	0.1691	0.0950	16.06	-157.43
6	5.5	0.3097	0.5642	0.1747	0.0950	16.60	-166.02

6	5.5	0.3197	0.5642	0.1804	0.0950	17.14	-174.61
6	5.5	0.3297	0.5642	0.1860	0.0950	17.67	-183.20
6	5.5	0.3397	0.5642	0.1917	0.0950	18.21	-191.79
6	5.5	0.3497	0.5642	0.1973	0.0950	18.74	-200.37
6	5.5	0.3597	0.5642	0.2029	0.0950	19.28	-208.96
6	5.5	0.3697	0.5642	0.2086	0.0950	19.82	-217.55
6	5.5	0.3797	0.5642	0.2142	0.0950	20.35	-226.14
6	5.5	0.3897	0.5642	0.2199	0.0950	20.89	-234.73
6	5.5	0.3997	0.5642	0.2255	0.0950	21.42	-243.32
6	5.5	0.4097	0.5642	0.2312	0.0950	21.96	-251.91
6	5.5	0.4197	0.5642	0.2368	0.0950	22.50	-260.50
6	5.5	0.4297	0.5642	0.2424	0.0950	23.03	-269.09
6	5.5	0.4397	0.5642	0.2481	0.0950	23.57	-277.68
6	5.5	0.4497	0.5642	0.2537	0.0950	24.10	-286.27
6	5.5	0.4597	0.5642	0.2594	0.0950	24.64	-294.86
6	5.5	0.4697	0.5642	0.2650	0.0950	25.18	-303.45
6	5.5	0.4797	0.5642	0.2706	0.0950	25.71	-312.04
6	5.5	0.4897	0.5642	0.2763	0.0950	26.25	-320.63
6	5.5	0.4997	0.5642	0.2819	0.0950	26.78	-329.22
6	5.5	0.5097	0.5642	0.2876	0.0950	27.32	-337.81
6	5.5	0.5197	0.5642	0.2932	0.0950	27.86	-346.40
6	5.5	0.5297	0.5642	0.2989	0.0950	28.39	-354.99
6	5.5	0.5397	0.5642	0.3045	0.0950	28.93	-363.57
6	5.5	0.5497	0.5642	0.3101	0.0950	29.46	-372.16
6	5.5	0.5597	0.5642	0.3158	0.0950	30.00	-380.75
6	5.5	0.5697	0.5642	0.3214	0.0950	30.54	-389.34
6	5.5	0.5797	0.5642	0.3271	0.0950	31.07	-397.93
6	5.5	0.5897	0.5642	0.3327	0.0950	31.61	-406.52
6	5.5	0.5997	0.5642	0.3383	0.0950	32.14	-415.11
6	5.5	0.6097	0.5642	0.3440	0.0950	32.68	-423.70
6	5.5	0.6197	0.5642	0.3496	0.0950	33.21	-432.29

Table B7: Range of C_d for set 1 model (Type 2b, Q = 5.34 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
6	5.2	0.0597	0.5642	0.0337	0.0920	3.10	41.97
6	5.2	0.0697	0.5642	0.0393	0.0920	3.62	32.25
6	5.2	0.0797	0.5642	0.0450	0.0920	4.14	22.53
6	5.2	0.0897	0.5642	0.0506	0.0920	4.66	12.81
6	5.2	0.0997	0.5642	0.0563	0.0920	**5.18**	**3.09**
6	5.2	0.1097	0.5642	0.0619	0.0920	5.69	-6.63
6	5.2	0.1197	0.5642	0.0675	0.0920	6.21	-16.35
6	5.2	0.1297	0.5642	0.0732	0.0920	6.73	-26.07
6	5.2	0.1397	0.5642	0.0788	0.0920	7.25	-35.79
6	5.2	0.1497	0.5642	0.0845	0.0920	7.77	-45.51
6	5.2	0.1597	0.5642	0.0901	0.0920	8.29	-55.23
6	5.2	0.1697	0.5642	0.0957	0.0920	8.81	-64.95
6	5.2	0.1797	0.5642	0.1014	0.0920	9.33	-74.67
6	5.2	0.1897	0.5642	0.1070	0.0920	9.85	-84.39
6	5.2	0.1997	0.5642	0.1127	0.0920	10.37	-94.11
6	5.2	0.2097	0.5642	0.1183	0.0920	10.88	-103.83
6	5.2	0.2197	0.5642	0.1240	0.0920	11.40	-113.55
6	5.2	0.2297	0.5642	0.1296	0.0920	11.92	-123.27
6	5.2	0.2397	0.5642	0.1352	0.0920	12.44	-132.99
6	5.2	0.2497	0.5642	0.1409	0.0920	12.96	-142.71
6	5.2	0.2597	0.5642	0.1465	0.0920	13.48	-152.43
6	5.2	0.2697	0.5642	0.1522	0.0920	14.00	-162.15
6	5.2	0.2797	0.5642	0.1578	0.0920	14.52	-171.87
6	5.2	0.2897	0.5642	0.1634	0.0920	15.04	-181.59
6	5.2	0.2997	0.5642	0.1691	0.0920	15.56	-191.31
6	5.2	0.3097	0.5642	0.1747	0.0920	16.08	-201.03
6	5.2	0.3197	0.5642	0.1804	0.0920	16.59	-210.75
6	5.2	0.3297	0.5642	0.1860	0.0920	17.11	-220.47
6	5.2	0.3397	0.5642	0.1917	0.0920	17.63	-230.20
6	5.2	0.3497	0.5642	0.1973	0.0920	18.15	-239.92
6	5.2	0.3597	0.5642	0.2029	0.0920	18.67	-249.64
6	5.2	0.3697	0.5642	0.2086	0.0920	19.19	-259.36
6	5.2	0.3797	0.5642	0.2142	0.0920	19.71	-269.08
6	5.2	0.3897	0.5642	0.2199	0.0920	20.23	-278.80
6	5.2	0.3997	0.5642	0.2255	0.0920	20.75	-288.52
6	5.2	0.4097	0.5642	0.2312	0.0920	21.27	-298.24
6	5.2	0.4197	0.5642	0.2368	0.0920	21.78	-307.96
6	5.2	0.4297	0.5642	0.2424	0.0920	22.30	-317.68
6	5.2	0.4397	0.5642	0.2481	0.0920	22.82	-327.40
6	5.2	0.4497	0.5642	0.2537	0.0920	23.34	-337.12
6	5.2	0.4597	0.5642	0.2594	0.0920	23.86	-346.84
6	5.2	0.4697	0.5642	0.2650	0.0920	24.38	-356.56
6	5.2	0.4797	0.5642	0.2706	0.0920	24.90	-366.28

6	5.2	0.4897	0.5642	0.2763	0.0920	25.42	-376.00
6	5.2	0.4997	0.5642	0.2819	0.0920	25.94	-385.72
6	5.2	0.5097	0.5642	0.2876	0.0920	26.46	-395.44
6	5.2	0.5197	0.5642	0.2932	0.0920	26.98	-405.16
6	5.2	0.5297	0.5642	0.2989	0.0920	27.49	-414.88
6	5.2	0.5397	0.5642	0.3045	0.0920	28.01	-424.60
6	5.2	0.5497	0.5642	0.3101	0.0920	28.53	-434.32
6	5.2	0.5597	0.5642	0.3158	0.0920	29.05	-444.04
6	5.2	0.5697	0.5642	0.3214	0.0920	29.57	-453.76
6	5.2	0.5797	0.5642	0.3271	0.0920	30.09	-463.48
6	5.2	0.5897	0.5642	0.3327	0.0920	30.61	-473.20
6	5.2	0.5997	0.5642	0.3383	0.0920	31.13	-482.92
6	5.2	0.6097	0.5642	0.3440	0.0920	31.65	-492.64
6	5.2	0.6197	0.5642	0.3496	0.0920	32.17	-502.36

Table B8: Range of C_d for set 1 model (Type 2c, Q = 4.40 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
6	4.68	0.0597	0.5642	0.0337	0.0868	2.92	33.55
6	4.68	0.0697	0.5642	0.0393	0.0868	3.41	22.42
6	4.68	0.0797	0.5642	0.0450	0.0868	3.90	11.29
6	4.68	0.0897	0.5642	0.0506	0.0868	**4.39**	**0.16**
6	4.68	0.0997	0.5642	0.0563	0.0868	4.88	-10.97
6	4.68	0.1097	0.5642	0.0619	0.0868	5.37	-22.10
6	4.68	0.1197	0.5642	0.0675	0.0868	5.86	-33.23
6	4.68	0.1297	0.5642	0.0732	0.0868	6.35	-44.36
6	4.68	0.1397	0.5642	0.0788	0.0868	6.84	-55.49
6	4.68	0.1497	0.5642	0.0845	0.0868	7.33	-66.62
6	4.68	0.1597	0.5642	0.0901	0.0868	7.82	-77.75
6	4.68	0.1697	0.5642	0.0957	0.0868	8.31	-88.88
6	4.68	0.1797	0.5642	0.1014	0.0868	8.80	-100.01
6	4.68	0.1897	0.5642	0.1070	0.0868	9.29	-111.14
6	4.68	0.1997	0.5642	0.1127	0.0868	9.78	-122.27
6	4.68	0.2097	0.5642	0.1183	0.0868	10.27	-133.40
6	4.68	0.2197	0.5642	0.1240	0.0868	10.76	-144.53
6	4.68	0.2297	0.5642	0.1296	0.0868	11.25	-155.66
6	4.68	0.2397	0.5642	0.1352	0.0868	11.74	-166.79
6	4.68	0.2497	0.5642	0.1409	0.0868	12.23	-177.92
6	4.68	0.2597	0.5642	0.1465	0.0868	12.72	-189.05
6	4.68	0.2697	0.5642	0.1522	0.0868	13.21	-200.18
6	4.68	0.2797	0.5642	0.1578	0.0868	13.70	-211.31
6	4.68	0.2897	0.5642	0.1634	0.0868	14.19	-222.44
6	4.68	0.2997	0.5642	0.1691	0.0868	14.68	-233.57
6	4.68	0.3097	0.5642	0.1747	0.0868	15.17	-244.70

6	4.68	0.3197	0.5642	0.1804	0.0868	15.66	-255.83
6	4.68	0.3297	0.5642	0.1860	0.0868	16.15	-266.96
6	4.68	0.3397	0.5642	0.1917	0.0868	16.64	-278.09
6	4.68	0.3497	0.5642	0.1973	0.0868	17.13	-289.22
6	4.68	0.3597	0.5642	0.2029	0.0868	17.62	-300.35
6	4.68	0.3697	0.5642	0.2086	0.0868	18.10	-311.48
6	4.68	0.3797	0.5642	0.2142	0.0868	18.59	-322.61
6	4.68	0.3897	0.5642	0.2199	0.0868	19.08	-333.74
6	4.68	0.3997	0.5642	0.2255	0.0868	19.57	-344.87
6	4.68	0.4097	0.5642	0.2312	0.0868	20.06	-356.00
6	4.68	0.4197	0.5642	0.2368	0.0868	20.55	-367.13
6	4.68	0.4297	0.5642	0.2424	0.0868	21.04	-378.26
6	4.68	0.4397	0.5642	0.2481	0.0868	21.53	-389.39
6	4.68	0.4497	0.5642	0.2537	0.0868	22.02	-400.52
6	4.68	0.4597	0.5642	0.2594	0.0868	22.51	-411.65
6	4.68	0.4697	0.5642	0.2650	0.0868	23.00	-422.78
6	4.68	0.4797	0.5642	0.2706	0.0868	23.49	-433.91
6	4.68	0.4897	0.5642	0.2763	0.0868	23.98	-445.04
6	4.68	0.4997	0.5642	0.2819	0.0868	24.47	-456.17
6	4.68	0.5097	0.5642	0.2876	0.0868	24.96	-467.30
6	4.68	0.5197	0.5642	0.2932	0.0868	25.45	-478.43
6	4.68	0.5297	0.5642	0.2989	0.0868	25.94	-489.56
6	4.68	0.5397	0.5642	0.3045	0.0868	26.43	-500.69
6	4.68	0.5497	0.5642	0.3101	0.0868	26.92	-511.82
6	4.68	0.5597	0.5642	0.3158	0.0868	27.41	-522.95
6	4.68	0.5697	0.5642	0.3214	0.0868	27.90	-534.08
6	4.68	0.5797	0.5642	0.3271	0.0868	28.39	-545.21
6	4.68	0.5897	0.5642	0.3327	0.0868	28.88	-556.34
6	4.68	0.5997	0.5642	0.3383	0.0868	29.37	-567.47
6	4.68	0.6097	0.5642	0.3440	0.0868	29.86	-578.60
6	4.68	0.6197	0.5642	0.3496	0.0868	30.35	-589.73

Table B9: Range of C_d for set 1 model (Type 2d, Q = 3.56 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
6	4.61	0.0597	0.5642	0.0337	0.0861	2.90	18.54
6	4.61	0.0697	0.5642	0.0393	0.0861	**3.39**	**4.89**
6	4.61	0.0797	0.5642	0.0450	0.0861	3.87	-8.75
6	4.61	0.0897	0.5642	0.0506	0.0861	4.36	-22.40
6	4.61	0.0997	0.5642	0.0563	0.0861	4.84	-36.04
6	4.61	0.1097	0.5642	0.0619	0.0861	5.33	-49.69
6	4.61	0.1197	0.5642	0.0675	0.0861	5.81	-63.33
6	4.61	0.1297	0.5642	0.0732	0.0861	6.30	-76.98
6	4.61	0.1397	0.5642	0.0788	0.0861	6.79	-90.62
6	4.61	0.1497	0.5642	0.0845	0.0861	7.27	-104.27
6	4.61	0.1597	0.5642	0.0901	0.0861	7.76	-117.91
6	4.61	0.1697	0.5642	0.0957	0.0861	8.24	-131.56
6	4.61	0.1797	0.5642	0.1014	0.0861	8.73	-145.21
6	4.61	0.1897	0.5642	0.1070	0.0861	9.22	-158.85
6	4.61	0.1997	0.5642	0.1127	0.0861	9.70	-172.50
6	4.61	0.2097	0.5642	0.1183	0.0861	10.19	-186.14
6	4.61	0.2197	0.5642	0.1240	0.0861	10.67	-199.79
6	4.61	0.2297	0.5642	0.1296	0.0861	11.16	-213.43
6	4.61	0.2397	0.5642	0.1352	0.0861	11.64	-227.08
6	4.61	0.2497	0.5642	0.1409	0.0861	12.13	-240.72
6	4.61	0.2597	0.5642	0.1465	0.0861	12.62	-254.37
6	4.61	0.2697	0.5642	0.1522	0.0861	13.10	-268.01
6	4.61	0.2797	0.5642	0.1578	0.0861	13.59	-281.66
6	4.61	0.2897	0.5642	0.1634	0.0861	14.07	-295.30
6	4.61	0.2997	0.5642	0.1691	0.0861	14.56	-308.95
6	4.61	0.3097	0.5642	0.1747	0.0861	15.04	-322.59
6	4.61	0.3197	0.5642	0.1804	0.0861	15.53	-336.24
6	4.61	0.3297	0.5642	0.1860	0.0861	16.02	-349.88
6	4.61	0.3397	0.5642	0.1917	0.0861	16.50	-363.53
6	4.61	0.3497	0.5642	0.1973	0.0861	16.99	-377.17
6	4.61	0.3597	0.5642	0.2029	0.0861	17.47	-390.82
6	4.61	0.3697	0.5642	0.2086	0.0861	17.96	-404.47
6	4.61	0.3797	0.5642	0.2142	0.0861	18.44	-418.11
6	4.61	0.3897	0.5642	0.2199	0.0861	18.93	-431.76
6	4.61	0.3997	0.5642	0.2255	0.0861	19.42	-445.40
6	4.61	0.4097	0.5642	0.2312	0.0861	19.90	-459.05
6	4.61	0.4197	0.5642	0.2368	0.0861	20.39	-472.69
6	4.61	0.4297	0.5642	0.2424	0.0861	20.87	-486.34
6	4.61	0.4397	0.5642	0.2481	0.0861	21.36	-499.98
6	4.61	0.4497	0.5642	0.2537	0.0861	21.85	-513.63
6	4.61	0.4597	0.5642	0.2594	0.0861	22.33	-527.27
6	4.61	0.4697	0.5642	0.2650	0.0861	22.82	-540.92
6	4.61	0.4797	0.5642	0.2706	0.0861	23.30	-554.56

6	4.61	0.4897	0.5642	0.2763	0.0861	23.79	-568.21
6	4.61	0.4997	0.5642	0.2819	0.0861	24.27	-581.85
6	4.61	0.5097	0.5642	0.2876	0.0861	24.76	-595.50
6	4.61	0.5197	0.5642	0.2932	0.0861	25.25	-609.14
6	4.61	0.5297	0.5642	0.2989	0.0861	25.73	-622.79
6	4.61	0.5397	0.5642	0.3045	0.0861	26.22	-636.43
6	4.61	0.5497	0.5642	0.3101	0.0861	26.70	-650.08
6	4.61	0.5597	0.5642	0.3158	0.0861	27.19	-663.72
6	4.61	0.5697	0.5642	0.3214	0.0861	27.67	-677.37
6	4.61	0.5797	0.5642	0.3271	0.0861	28.16	-691.02
6	4.61	0.5897	0.5642	0.3327	0.0861	28.65	-704.66
6	4.61	0.5997	0.5642	0.3383	0.0861	29.13	-718.31
6	4.61	0.6097	0.5642	0.3440	0.0861	29.62	-731.95
6	4.61	0.6197	0.5642	0.3496	0.0861	30.10	-745.60

Table B10: Range of C_d for set 1 model (Type 2e, Q = 2.98 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
6	4.3	0.0597	0.5642	0.0337	0.0830	**2.80**	**6.19**
6	4.3	0.0697	0.5642	0.0393	0.0830	3.26	-9.53
6	4.3	0.0797	0.5642	0.0450	0.0830	3.73	-25.24
6	4.3	0.0897	0.5642	0.0506	0.0830	4.20	-40.96
6	4.3	0.0997	0.5642	0.0563	0.0830	4.67	-56.67
6	4.3	0.1097	0.5642	0.0619	0.0830	5.14	-72.38
6	4.3	0.1197	0.5642	0.0675	0.0830	5.61	-88.10
6	4.3	0.1297	0.5642	0.0732	0.0830	6.07	-103.81
6	4.3	0.1397	0.5642	0.0788	0.0830	6.54	-119.53
6	4.3	0.1497	0.5642	0.0845	0.0830	7.01	-135.24
6	4.3	0.1597	0.5642	0.0901	0.0830	7.48	-150.95
6	4.3	0.1697	0.5642	0.0957	0.0830	7.95	-166.67
6	4.3	0.1797	0.5642	0.1014	0.0830	8.42	-182.38
6	4.3	0.1897	0.5642	0.1070	0.0830	8.88	-198.10
6	4.3	0.1997	0.5642	0.1127	0.0830	9.35	-213.81
6	4.3	0.2097	0.5642	0.1183	0.0830	9.82	-229.53
6	4.3	0.2197	0.5642	0.1240	0.0830	10.29	-245.24
6	4.3	0.2297	0.5642	0.1296	0.0830	10.76	-260.95
6	4.3	0.2397	0.5642	0.1352	0.0830	11.22	-276.67
6	4.3	0.2497	0.5642	0.1409	0.0830	11.69	-292.38
6	4.3	0.2597	0.5642	0.1465	0.0830	12.16	-308.10
6	4.3	0.2697	0.5642	0.1522	0.0830	12.63	-323.81
6	4.3	0.2797	0.5642	0.1578	0.0830	13.10	-339.52
6	4.3	0.2897	0.5642	0.1634	0.0830	13.57	-355.24
6	4.3	0.2997	0.5642	0.1691	0.0830	14.03	-370.95
6	4.3	0.3097	0.5642	0.1747	0.0830	14.50	-386.67

6	4.3	0.3197	0.5642	0.1804	0.0830	14.97	-402.38
6	4.3	0.3297	0.5642	0.1860	0.0830	15.44	-418.09
6	4.3	0.3397	0.5642	0.1917	0.0830	15.91	-433.81
6	4.3	0.3497	0.5642	0.1973	0.0830	16.38	-449.52
6	4.3	0.3597	0.5642	0.2029	0.0830	16.84	-465.24
6	4.3	0.3697	0.5642	0.2086	0.0830	17.31	-480.95
6	4.3	0.3797	0.5642	0.2142	0.0830	17.78	-496.67
6	4.3	0.3897	0.5642	0.2199	0.0830	18.25	-512.38
6	4.3	0.3997	0.5642	0.2255	0.0830	18.72	-528.09
6	4.3	0.4097	0.5642	0.2312	0.0830	19.19	-543.81
6	4.3	0.4197	0.5642	0.2368	0.0830	19.65	-559.52
6	4.3	0.4297	0.5642	0.2424	0.0830	20.12	-575.24
6	4.3	0.4397	0.5642	0.2481	0.0830	20.59	-590.95
6	4.3	0.4497	0.5642	0.2537	0.0830	21.06	-606.66
6	4.3	0.4597	0.5642	0.2594	0.0830	21.53	-622.38
6	4.3	0.4697	0.5642	0.2650	0.0830	22.00	-638.09
6	4.3	0.4797	0.5642	0.2706	0.0830	22.46	-653.81
6	4.3	0.4897	0.5642	0.2763	0.0830	22.93	-669.52
6	4.3	0.4997	0.5642	0.2819	0.0830	23.40	-685.23
6	4.3	0.5097	0.5642	0.2876	0.0830	23.87	-700.95
6	4.3	0.5197	0.5642	0.2932	0.0830	24.34	-716.66
6	4.3	0.5297	0.5642	0.2989	0.0830	24.80	-732.38
6	4.3	0.5397	0.5642	0.3045	0.0830	25.27	-748.09
6	4.3	0.5497	0.5642	0.3101	0.0830	25.74	-763.81
6	4.3	0.5597	0.5642	0.3158	0.0830	26.21	-779.52
6	4.3	0.5697	0.5642	0.3214	0.0830	26.68	-795.23
6	4.3	0.5797	0.5642	0.3271	0.0830	27.15	-810.95
6	4.3	0.5897	0.5642	0.3327	0.0830	27.61	-826.66
6	4.3	0.5997	0.5642	0.3383	0.0830	28.08	-842.38
6	4.3	0.6097	0.5642	0.3440	0.0830	28.55	-858.09
6	4.3	0.6197	0.5642	0.3496	0.0830	29.02	-873.80

Table B11: Range of C_d for set 1 model (Type 3a, Q = 6.24 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
8	4.5	0.0597	0.6515	0.0389	0.0983	3.82	38.71
8	4.5	0.0697	0.6515	0.0454	0.0983	4.47	28.44
8	4.5	0.0797	0.6515	0.0519	0.0983	5.11	18.18
8	4.5	0.0897	0.6515	0.0584	0.0983	5.75	7.91
8	4.5	0.0997	0.6515	0.0650	0.0983	**6.39**	**-2.36**
8	4.5	0.1097	0.6515	0.0715	0.0983	7.03	-12.62
8	4.5	0.1197	0.6515	0.0780	0.0983	7.67	-22.89
8	4.5	0.1297	0.6515	0.0845	0.0983	8.31	-33.15
8	4.5	0.1397	0.6515	0.0910	0.0983	8.95	-43.42
8	4.5	0.1497	0.6515	0.0975	0.0983	9.59	-53.69
8	4.5	0.1597	0.6515	0.1040	0.0983	10.23	-63.95
8	4.5	0.1697	0.6515	0.1106	0.0983	10.87	-74.22
8	4.5	0.1797	0.6515	0.1171	0.0983	11.51	-84.49
8	4.5	0.1897	0.6515	0.1236	0.0983	12.15	-94.75
8	4.5	0.1997	0.6515	0.1301	0.0983	12.79	-105.02
8	4.5	0.2097	0.6515	0.1366	0.0983	13.43	-115.28
8	4.5	0.2197	0.6515	0.1431	0.0983	14.07	-125.55
8	4.5	0.2297	0.6515	0.1496	0.0983	14.71	-135.82
8	4.5	0.2397	0.6515	0.1562	0.0983	15.36	-146.08
8	4.5	0.2497	0.6515	0.1627	0.0983	16.00	-156.35
8	4.5	0.2597	0.6515	0.1692	0.0983	16.64	-166.62
8	4.5	0.2697	0.6515	0.1757	0.0983	17.28	-176.88
8	4.5	0.2797	0.6515	0.1822	0.0983	17.92	-187.15
8	4.5	0.2897	0.6515	0.1887	0.0983	18.56	-197.41
8	4.5	0.2997	0.6515	0.1952	0.0983	19.20	-207.68
8	4.5	0.3097	0.6515	0.2018	0.0983	19.84	-217.95
8	4.5	0.3197	0.6515	0.2083	0.0983	20.48	-228.21
8	4.5	0.3297	0.6515	0.2148	0.0983	21.12	-238.48
8	4.5	0.3397	0.6515	0.2213	0.0983	21.76	-248.75
8	4.5	0.3497	0.6515	0.2278	0.0983	22.40	-259.01
8	4.5	0.3597	0.6515	0.2343	0.0983	23.04	-269.28
8	4.5	0.3697	0.6515	0.2409	0.0983	23.68	-279.55
8	4.5	0.3797	0.6515	0.2474	0.0983	24.32	-289.81
8	4.5	0.3897	0.6515	0.2539	0.0983	24.96	-300.08
8	4.5	0.3997	0.6515	0.2604	0.0983	25.61	-310.34
8	4.5	0.4097	0.6515	0.2669	0.0983	26.25	-320.61
8	4.5	0.4197	0.6515	0.2734	0.0983	26.89	-330.88
8	4.5	0.4297	0.6515	0.2799	0.0983	27.53	-341.14
8	4.5	0.4397	0.6515	0.2865	0.0983	28.17	-351.41
8	4.5	0.4497	0.6515	0.2930	0.0983	28.81	-361.68
8	4.5	0.4597	0.6515	0.2995	0.0983	29.45	-371.94
8	4.5	0.4697	0.6515	0.3060	0.0983	30.09	-382.21
8	4.5	0.4797	0.6515	0.3125	0.0983	30.73	-392.47

8	4.5	0.4897	0.6515	0.3190	0.0983	31.37	-402.74
8	4.5	0.4997	0.6515	0.3255	0.0983	32.01	-413.01
8	4.5	0.5097	0.6515	0.3321	0.0983	32.65	-423.27
8	4.5	0.5197	0.6515	0.3386	0.0983	33.29	-433.54
8	4.5	0.5297	0.6515	0.3451	0.0983	33.93	-443.81
8	4.5	0.5397	0.6515	0.3516	0.0983	34.57	-454.07
8	4.5	0.5497	0.6515	0.3581	0.0983	35.21	-464.34
8	4.5	0.5597	0.6515	0.3646	0.0983	35.86	-474.60
8	4.5	0.5697	0.6515	0.3711	0.0983	36.50	-484.87
8	4.5	0.5797	0.6515	0.3777	0.0983	37.14	-495.14
8	4.5	0.5897	0.6515	0.3842	0.0983	37.78	-505.40
8	4.5	0.5997	0.6515	0.3907	0.0983	38.42	-515.67
8	4.5	0.6097	0.6515	0.3972	0.0983	39.06	-525.94
8	4.5	0.6197	0.6515	0.4037	0.0983	39.70	-536.20

Table B12: Range of C_d for set 1 model (Type 3b, Q = 5.34 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
8	4.45	0.0597	0.6515	0.0389	0.0978	3.81	28.74
8	4.45	0.0697	0.6515	0.0454	0.0978	4.44	16.81
8	4.45	0.0797	0.6515	0.0519	0.0978	**5.08**	**4.87**
8	4.45	0.0897	0.6515	0.0584	0.0978	5.72	-7.06
8	4.45	0.0997	0.6515	0.0650	0.0978	6.35	-19.00
8	4.45	0.1097	0.6515	0.0715	0.0978	6.99	-30.93
8	4.45	0.1197	0.6515	0.0780	0.0978	7.63	-42.87
8	4.45	0.1297	0.6515	0.0845	0.0978	8.27	-54.80
8	4.45	0.1397	0.6515	0.0910	0.0978	8.90	-66.74
8	4.45	0.1497	0.6515	0.0975	0.0978	9.54	-78.68
8	4.45	0.1597	0.6515	0.1040	0.0978	10.18	-90.61
8	4.45	0.1697	0.6515	0.1106	0.0978	10.82	-102.55
8	4.45	0.1797	0.6515	0.1171	0.0978	11.45	-114.48
8	4.45	0.1897	0.6515	0.1236	0.0978	12.09	-126.42
8	4.45	0.1997	0.6515	0.1301	0.0978	12.73	-138.35
8	4.45	0.2097	0.6515	0.1366	0.0978	13.37	-150.29
8	4.45	0.2197	0.6515	0.1431	0.0978	14.00	-162.22
8	4.45	0.2297	0.6515	0.1496	0.0978	14.64	-174.16
8	4.45	0.2397	0.6515	0.1562	0.0978	15.28	-186.10
8	4.45	0.2497	0.6515	0.1627	0.0978	15.91	-198.03
8	4.45	0.2597	0.6515	0.1692	0.0978	16.55	-209.97
8	4.45	0.2697	0.6515	0.1757	0.0978	17.19	-221.90
8	4.45	0.2797	0.6515	0.1822	0.0978	17.83	-233.84
8	4.45	0.2897	0.6515	0.1887	0.0978	18.46	-245.77
8	4.45	0.2997	0.6515	0.1952	0.0978	19.10	-257.71
8	4.45	0.3097	0.6515	0.2018	0.0978	19.74	-269.64

8	4.45	0.3197	0.6515	0.2083	0.0978	20.38	-281.58
8	4.45	0.3297	0.6515	0.2148	0.0978	21.01	-293.52
8	4.45	0.3397	0.6515	0.2213	0.0978	21.65	-305.45
8	4.45	0.3497	0.6515	0.2278	0.0978	22.29	-317.39
8	4.45	0.3597	0.6515	0.2343	0.0978	22.93	-329.32
8	4.45	0.3697	0.6515	0.2409	0.0978	23.56	-341.26
8	4.45	0.3797	0.6515	0.2474	0.0978	24.20	-353.19
8	4.45	0.3897	0.6515	0.2539	0.0978	24.84	-365.13
8	4.45	0.3997	0.6515	0.2604	0.0978	25.48	-377.07
8	4.45	0.4097	0.6515	0.2669	0.0978	26.11	-389.00
8	4.45	0.4197	0.6515	0.2734	0.0978	26.75	-400.94
8	4.45	0.4297	0.6515	0.2799	0.0978	27.39	-412.87
8	4.45	0.4397	0.6515	0.2865	0.0978	28.02	-424.81
8	4.45	0.4497	0.6515	0.2930	0.0978	28.66	-436.74
8	4.45	0.4597	0.6515	0.2995	0.0978	29.30	-448.68
8	4.45	0.4697	0.6515	0.3060	0.0978	29.94	-460.61
8	4.45	0.4797	0.6515	0.3125	0.0978	30.57	-472.55
8	4.45	0.4897	0.6515	0.3190	0.0978	31.21	-484.49
8	4.45	0.4997	0.6515	0.3255	0.0978	31.85	-496.42
8	4.45	0.5097	0.6515	0.3321	0.0978	32.49	-508.36
8	4.45	0.5197	0.6515	0.3386	0.0978	33.12	-520.29
8	4.45	0.5297	0.6515	0.3451	0.0978	33.76	-532.23
8	4.45	0.5397	0.6515	0.3516	0.0978	34.40	-544.16
8	4.45	0.5497	0.6515	0.3581	0.0978	35.04	-556.10
8	4.45	0.5597	0.6515	0.3646	0.0978	35.67	-568.03
8	4.45	0.5697	0.6515	0.3711	0.0978	36.31	-579.97
8	4.45	0.5797	0.6515	0.3777	0.0978	36.95	-591.91
8	4.45	0.5897	0.6515	0.3842	0.0978	37.59	-603.84
8	4.45	0.5997	0.6515	0.3907	0.0978	38.22	-615.78
8	4.45	0.6097	0.6515	0.3972	0.0978	38.86	-627.71
8	4.45	0.6197	0.6515	0.4037	0.0978	39.50	-639.65

Table B13: Range of C_d for set 1 model (Type 3c, Q = 4.40 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
8	4.3	0.0597	0.6515	0.0389	0.0963	3.75	14.85
8	4.3	0.0697	0.6515	0.0454	0.0963	**4.37**	**0.58**
8	4.3	0.0797	0.6515	0.0519	0.0963	5.00	-13.68
8	4.3	0.0897	0.6515	0.0584	0.0963	5.63	-27.94
8	4.3	0.0997	0.6515	0.0650	0.0963	6.26	-42.21
8	4.3	0.1097	0.6515	0.0715	0.0963	6.88	-56.47
8	4.3	0.1197	0.6515	0.0780	0.0963	7.51	-70.73
8	4.3	0.1297	0.6515	0.0845	0.0963	8.14	-85.00
8	4.3	0.1397	0.6515	0.0910	0.0963	8.77	-99.26
8	4.3	0.1497	0.6515	0.0975	0.0963	9.39	-113.52
8	4.3	0.1597	0.6515	0.1040	0.0963	10.02	-127.79
8	4.3	0.1697	0.6515	0.1106	0.0963	10.65	-142.05
8	4.3	0.1797	0.6515	0.1171	0.0963	11.28	-156.31
8	4.3	0.1897	0.6515	0.1236	0.0963	11.91	-170.58
8	4.3	0.1997	0.6515	0.1301	0.0963	12.53	-184.84
8	4.3	0.2097	0.6515	0.1366	0.0963	13.16	-199.10
8	4.3	0.2197	0.6515	0.1431	0.0963	13.79	-213.37
8	4.3	0.2297	0.6515	0.1496	0.0963	14.42	-227.63
8	4.3	0.2397	0.6515	0.1562	0.0963	15.04	-241.89
8	4.3	0.2497	0.6515	0.1627	0.0963	15.67	-256.16
8	4.3	0.2597	0.6515	0.1692	0.0963	16.30	-270.42
8	4.3	0.2697	0.6515	0.1757	0.0963	16.93	-284.68
8	4.3	0.2797	0.6515	0.1822	0.0963	17.55	-298.95
8	4.3	0.2897	0.6515	0.1887	0.0963	18.18	-313.21
8	4.3	0.2997	0.6515	0.1952	0.0963	18.81	-327.47
8	4.3	0.3097	0.6515	0.2018	0.0963	19.44	-341.74
8	4.3	0.3197	0.6515	0.2083	0.0963	20.06	-356.00
8	4.3	0.3297	0.6515	0.2148	0.0963	20.69	-370.26
8	4.3	0.3397	0.6515	0.2213	0.0963	21.32	-384.53
8	4.3	0.3497	0.6515	0.2278	0.0963	21.95	-398.79
8	4.3	0.3597	0.6515	0.2343	0.0963	22.57	-413.05
8	4.3	0.3697	0.6515	0.2409	0.0963	23.20	-427.32
8	4.3	0.3797	0.6515	0.2474	0.0963	23.83	-441.58
8	4.3	0.3897	0.6515	0.2539	0.0963	24.46	-455.84
8	4.3	0.3997	0.6515	0.2604	0.0963	25.08	-470.11
8	4.3	0.4097	0.6515	0.2669	0.0963	25.71	-484.37
8	4.3	0.4197	0.6515	0.2734	0.0963	26.34	-498.63
8	4.3	0.4297	0.6515	0.2799	0.0963	26.97	-512.90
8	4.3	0.4397	0.6515	0.2865	0.0963	27.60	-527.16
8	4.3	0.4497	0.6515	0.2930	0.0963	28.22	-541.42
8	4.3	0.4597	0.6515	0.2995	0.0963	28.85	-555.69
8	4.3	0.4697	0.6515	0.3060	0.0963	29.48	-569.95
8	4.3	0.4797	0.6515	0.3125	0.0963	30.11	-584.21

8	4.3	0.4897	0.6515	0.3190	0.0963	30.73	-598.48
8	4.3	0.4997	0.6515	0.3255	0.0963	31.36	-612.74
8	4.3	0.5097	0.6515	0.3321	0.0963	31.99	-627.00
8	4.3	0.5197	0.6515	0.3386	0.0963	32.62	-641.27
8	4.3	0.5297	0.6515	0.3451	0.0963	33.24	-655.53
8	4.3	0.5397	0.6515	0.3516	0.0963	33.87	-669.79
8	4.3	0.5497	0.6515	0.3581	0.0963	34.50	-684.06
8	4.3	0.5597	0.6515	0.3646	0.0963	35.13	-698.32
8	4.3	0.5697	0.6515	0.3711	0.0963	35.75	-712.58
8	4.3	0.5797	0.6515	0.3777	0.0963	36.38	-726.85
8	4.3	0.5897	0.6515	0.3842	0.0963	37.01	-741.11
8	4.3	0.5997	0.6515	0.3907	0.0963	37.64	-755.37
8	4.3	0.6097	0.6515	0.3972	0.0963	38.26	-769.64
8	4.3	0.6197	0.6515	0.4037	0.0963	38.89	-783.90

Table B14: Range of C_d for set 1 model (Type 3d, Q = 3.56 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
8	4.25	0.0597	0.6515	0.0389	0.0958	**3.73**	**-4.70**
8	4.25	0.0697	0.6515	0.0454	0.0958	4.35	-22.24
8	4.25	0.0797	0.6515	0.0519	0.0958	4.98	-39.77
8	4.25	0.0897	0.6515	0.0584	0.0958	5.60	-57.31
8	4.25	0.0997	0.6515	0.0650	0.0958	6.22	-74.85
8	4.25	0.1097	0.6515	0.0715	0.0958	6.85	-92.38
8	4.25	0.1197	0.6515	0.0780	0.0958	7.47	-109.92
8	4.25	0.1297	0.6515	0.0845	0.0958	8.10	-127.46
8	4.25	0.1397	0.6515	0.0910	0.0958	8.72	-145.00
8	4.25	0.1497	0.6515	0.0975	0.0958	9.35	-162.53
8	4.25	0.1597	0.6515	0.1040	0.0958	9.97	-180.07
8	4.25	0.1697	0.6515	0.1106	0.0958	10.59	-197.61
8	4.25	0.1797	0.6515	0.1171	0.0958	11.22	-215.15
8	4.25	0.1897	0.6515	0.1236	0.0958	11.84	-232.68
8	4.25	0.1997	0.6515	0.1301	0.0958	12.47	-250.22
8	4.25	0.2097	0.6515	0.1366	0.0958	13.09	-267.76
8	4.25	0.2197	0.6515	0.1431	0.0958	13.72	-285.30
8	4.25	0.2297	0.6515	0.1496	0.0958	14.34	-302.83
8	4.25	0.2397	0.6515	0.1562	0.0958	14.97	-320.37
8	4.25	0.2497	0.6515	0.1627	0.0958	15.59	-337.91
8	4.25	0.2597	0.6515	0.1692	0.0958	16.21	-355.45
8	4.25	0.2697	0.6515	0.1757	0.0958	16.84	-372.98
8	4.25	0.2797	0.6515	0.1822	0.0958	17.46	-390.52
8	4.25	0.2897	0.6515	0.1887	0.0958	18.09	-408.06
8	4.25	0.2997	0.6515	0.1952	0.0958	18.71	-425.59
8	4.25	0.3097	0.6515	0.2018	0.0958	19.34	-443.13

8	4.25	0.3197	0.6515	0.2083	0.0958	19.96	-460.67
8	4.25	0.3297	0.6515	0.2148	0.0958	20.58	-478.21
8	4.25	0.3397	0.6515	0.2213	0.0958	21.21	-495.74
8	4.25	0.3497	0.6515	0.2278	0.0958	21.83	-513.28
8	4.25	0.3597	0.6515	0.2343	0.0958	22.46	-530.82
8	4.25	0.3697	0.6515	0.2409	0.0958	23.08	-548.36
8	4.25	0.3797	0.6515	0.2474	0.0958	23.71	-565.89
8	4.25	0.3897	0.6515	0.2539	0.0958	24.33	-583.43
8	4.25	0.3997	0.6515	0.2604	0.0958	24.95	-600.97
8	4.25	0.4097	0.6515	0.2669	0.0958	25.58	-618.51
8	4.25	0.4197	0.6515	0.2734	0.0958	26.20	-636.04
8	4.25	0.4297	0.6515	0.2799	0.0958	26.83	-653.58
8	4.25	0.4397	0.6515	0.2865	0.0958	27.45	-671.12
8	4.25	0.4497	0.6515	0.2930	0.0958	28.08	-688.66
8	4.25	0.4597	0.6515	0.2995	0.0958	28.70	-706.19
8	4.25	0.4697	0.6515	0.3060	0.0958	29.32	-723.73
8	4.25	0.4797	0.6515	0.3125	0.0958	29.95	-741.27
8	4.25	0.4897	0.6515	0.3190	0.0958	30.57	-758.80
8	4.25	0.4997	0.6515	0.3255	0.0958	31.20	-776.34
8	4.25	0.5097	0.6515	0.3321	0.0958	31.82	-793.88
8	4.25	0.5197	0.6515	0.3386	0.0958	32.45	-811.42
8	4.25	0.5297	0.6515	0.3451	0.0958	33.07	-828.95
8	4.25	0.5397	0.6515	0.3516	0.0958	33.70	-846.49
8	4.25	0.5497	0.6515	0.3581	0.0958	34.32	-864.03
8	4.25	0.5597	0.6515	0.3646	0.0958	34.94	-881.57
8	4.25	0.5697	0.6515	0.3711	0.0958	35.57	-899.10
8	4.25	0.5797	0.6515	0.3777	0.0958	36.19	-916.64
8	4.25	0.5897	0.6515	0.3842	0.0958	36.82	-934.18
8	4.25	0.5997	0.6515	0.3907	0.0958	37.44	-951.72
8	4.25	0.6097	0.6515	0.3972	0.0958	38.07	-969.25
8	4.25	0.6197	0.6515	0.4037	0.0958	38.69	-986.79

Table B15: Range of C_d for set 1 model (Type 3e, Q = 2.98 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
8	4.2	0.0597	0.6515	0.0389	0.0953	**3.71**	**-24.42**
8	4.2	0.0697	0.6515	0.0454	0.0953	4.33	-45.26
8	4.2	0.0797	0.6515	0.0519	0.0953	4.95	-66.11
8	4.2	0.0897	0.6515	0.0584	0.0953	5.57	-86.95
8	4.2	0.0997	0.6515	0.0650	0.0953	6.19	-107.79
8	4.2	0.1097	0.6515	0.0715	0.0953	6.81	-128.63
8	4.2	0.1197	0.6515	0.0780	0.0953	7.43	-149.47
8	4.2	0.1297	0.6515	0.0845	0.0953	8.06	-170.31
8	4.2	0.1397	0.6515	0.0910	0.0953	8.68	-191.15

8	4.2	0.1497	0.6515	0.0975	0.0953	9.30	-212.00
8	4.2	0.1597	0.6515	0.1040	0.0953	9.92	-232.84
8	4.2	0.1697	0.6515	0.1106	0.0953	10.54	-253.68
8	4.2	0.1797	0.6515	0.1171	0.0953	11.16	-274.52
8	4.2	0.1897	0.6515	0.1236	0.0953	11.78	-295.36
8	4.2	0.1997	0.6515	0.1301	0.0953	12.40	-316.20
8	4.2	0.2097	0.6515	0.1366	0.0953	13.02	-337.04
8	4.2	0.2197	0.6515	0.1431	0.0953	13.64	-357.88
8	4.2	0.2297	0.6515	0.1496	0.0953	14.27	-378.73
8	4.2	0.2397	0.6515	0.1562	0.0953	14.89	-399.57
8	4.2	0.2497	0.6515	0.1627	0.0953	15.51	-420.41
8	4.2	0.2597	0.6515	0.1692	0.0953	16.13	-441.25
8	4.2	0.2697	0.6515	0.1757	0.0953	16.75	-462.09
8	4.2	0.2797	0.6515	0.1822	0.0953	17.37	-482.93
8	4.2	0.2897	0.6515	0.1887	0.0953	17.99	-503.77
8	4.2	0.2997	0.6515	0.1952	0.0953	18.61	-524.62
8	4.2	0.3097	0.6515	0.2018	0.0953	19.23	-545.46
8	4.2	0.3197	0.6515	0.2083	0.0953	19.86	-566.30
8	4.2	0.3297	0.6515	0.2148	0.0953	20.48	-587.14
8	4.2	0.3397	0.6515	0.2213	0.0953	21.10	-607.98
8	4.2	0.3497	0.6515	0.2278	0.0953	21.72	-628.82
8	4.2	0.3597	0.6515	0.2343	0.0953	22.34	-649.66
8	4.2	0.3697	0.6515	0.2409	0.0953	22.96	-670.51
8	4.2	0.3797	0.6515	0.2474	0.0953	23.58	-691.35
8	4.2	0.3897	0.6515	0.2539	0.0953	24.20	-712.19
8	4.2	0.3997	0.6515	0.2604	0.0953	24.82	-733.03
8	4.2	0.4097	0.6515	0.2669	0.0953	25.45	-753.87
8	4.2	0.4197	0.6515	0.2734	0.0953	26.07	-774.71
8	4.2	0.4297	0.6515	0.2799	0.0953	26.69	-795.55
8	4.2	0.4397	0.6515	0.2865	0.0953	27.31	-816.40
8	4.2	0.4497	0.6515	0.2930	0.0953	27.93	-837.24
8	4.2	0.4597	0.6515	0.2995	0.0953	28.55	-858.08
8	4.2	0.4697	0.6515	0.3060	0.0953	29.17	-878.92
8	4.2	0.4797	0.6515	0.3125	0.0953	29.79	-899.76
8	4.2	0.4897	0.6515	0.3190	0.0953	30.41	-920.60
8	4.2	0.4997	0.6515	0.3255	0.0953	31.04	-941.44
8	4.2	0.5097	0.6515	0.3321	0.0953	31.66	-962.28
8	4.2	0.5197	0.6515	0.3386	0.0953	32.28	-983.13
8	4.2	0.5297	0.6515	0.3451	0.0953	32.90	-1003.97
8	4.2	0.5397	0.6515	0.3516	0.0953	33.52	-1024.81
8	4.2	0.5497	0.6515	0.3581	0.0953	34.14	-1045.65
8	4.2	0.5597	0.6515	0.3646	0.0953	34.76	-1066.49
8	4.2	0.5697	0.6515	0.3711	0.0953	35.38	-1087.33
8	4.2	0.5797	0.6515	0.3777	0.0953	36.00	-1108.17
8	4.2	0.5897	0.6515	0.3842	0.0953	36.62	-1129.02
8	4.2	0.5997	0.6515	0.3907	0.0953	37.25	-1149.86

8	4.2	0.6097	0.6515	0.3972	0.0953	37.87	-1170.70
8	4.2	0.6197	0.6515	0.4037	0.0953	38.49	-1191.54

Table B16: Range of C_d for set 1 model (Type 4a, Q = 6.24 l/s)

s (cm)	h (cm)	Cd	m	Co	X	Qt (l/s)	% Error
10	4.5	0.0597	0.7284	0.0435	0.1117	4.86	22.18
10	4.5	0.0697	0.7284	0.0508	0.1117	5.67	9.15
10	4.5	0.0797	0.7284	0.0581	0.1117	**6.48**	**-3.88**
10	4.5	0.0897	0.7284	0.0653	0.1117	7.30	-16.92
10	4.5	0.0997	0.7284	0.0726	0.1117	8.11	-29.95
10	4.5	0.1097	0.7284	0.0799	0.1117	8.92	-42.99
10	4.5	0.1197	0.7284	0.0872	0.1117	9.74	-56.02
10	4.5	0.1297	0.7284	0.0945	0.1117	10.55	-69.06
10	4.5	0.1397	0.7284	0.1018	0.1117	11.36	-82.09
10	4.5	0.1497	0.7284	0.1090	0.1117	12.18	-95.13
10	4.5	0.1597	0.7284	0.1163	0.1117	12.99	-108.16
10	4.5	0.1697	0.7284	0.1236	0.1117	13.80	-121.19
10	4.5	0.1797	0.7284	0.1309	0.1117	14.62	-134.23
10	4.5	0.1897	0.7284	0.1382	0.1117	15.43	-147.26
10	4.5	0.1997	0.7284	0.1455	0.1117	16.24	-160.30
10	4.5	0.2097	0.7284	0.1527	0.1117	17.06	-173.33
10	4.5	0.2197	0.7284	0.1600	0.1117	17.87	-186.37
10	4.5	0.2297	0.7284	0.1673	0.1117	18.68	-199.40
10	4.5	0.2397	0.7284	0.1746	0.1117	19.50	-212.44
10	4.5	0.2497	0.7284	0.1819	0.1117	20.31	-225.47
10	4.5	0.2597	0.7284	0.1892	0.1117	21.12	-238.50
10	4.5	0.2697	0.7284	0.1964	0.1117	21.94	-251.54
10	4.5	0.2797	0.7284	0.2037	0.1117	22.75	-264.57
10	4.5	0.2897	0.7284	0.2110	0.1117	23.56	-277.61
10	4.5	0.2997	0.7284	0.2183	0.1117	24.38	-290.64
10	4.5	0.3097	0.7284	0.2256	0.1117	25.19	-303.68
10	4.5	0.3197	0.7284	0.2329	0.1117	26.00	-316.71
10	4.5	0.3297	0.7284	0.2401	0.1117	26.82	-329.74
10	4.5	0.3397	0.7284	0.2474	0.1117	27.63	-342.78
10	4.5	0.3497	0.7284	0.2547	0.1117	28.44	-355.81
10	4.5	0.3597	0.7284	0.2620	0.1117	29.26	-368.85
10	4.5	0.3697	0.7284	0.2693	0.1117	30.07	-381.88
10	4.5	0.3797	0.7284	0.2766	0.1117	30.88	-394.92
10	4.5	0.3897	0.7284	0.2838	0.1117	31.70	-407.95
10	4.5	0.3997	0.7284	0.2911	0.1117	32.51	-420.99
10	4.5	0.4097	0.7284	0.2984	0.1117	33.32	-434.02
10	4.5	0.4197	0.7284	0.3057	0.1117	34.14	-447.05
10	4.5	0.4297	0.7284	0.3130	0.1117	34.95	-460.09

10	4.5	0.4397	0.7284	0.3203	0.1117	35.76	-473.12
10	4.5	0.4497	0.7284	0.3275	0.1117	36.58	-486.16
10	4.5	0.4597	0.7284	0.3348	0.1117	37.39	-499.19
10	4.5	0.4697	0.7284	0.3421	0.1117	38.20	-512.23
10	4.5	0.4797	0.7284	0.3494	0.1117	39.02	-525.26
10	4.5	0.4897	0.7284	0.3567	0.1117	39.83	-538.30
10	4.5	0.4997	0.7284	0.3640	0.1117	40.64	-551.33
10	4.5	0.5097	0.7284	0.3713	0.1117	41.46	-564.36
10	4.5	0.5197	0.7284	0.3785	0.1117	42.27	-577.40
10	4.5	0.5297	0.7284	0.3858	0.1117	43.08	-590.43
10	4.5	0.5397	0.7284	0.3931	0.1117	43.90	-603.47
10	4.5	0.5497	0.7284	0.4004	0.1117	44.71	-616.50
10	4.5	0.5597	0.7284	0.4077	0.1117	45.52	-629.54
10	4.5	0.5697	0.7284	0.4150	0.1117	46.34	-642.57
10	4.5	0.5797	0.7284	0.4222	0.1117	47.15	-655.61
10	4.5	0.5897	0.7284	0.4295	0.1117	47.96	-668.64
10	4.5	0.5997	0.7284	0.4368	0.1117	48.78	-681.67
10	4.5	0.6097	0.7284	0.4441	0.1117	49.59	-694.71
10	4.5	0.6197	0.7284	0.4514	0.1117	50.40	-707.74

Table B17: Range of C_d for set 1 model (Type 4b, Q = 5.34 l/s)

s (cm)	h (cm)	Cd	m	Co	X	Qt (l/s)	% Error
10	4.4	0.0597	0.7284	0.0435	0.1107	4.81	9.88
10	4.4	0.0697	0.7284	0.0508	0.1107	**5.62**	**-5.21**
10	4.4	0.0797	0.7284	0.0581	0.1107	6.42	-20.31
10	4.4	0.0897	0.7284	0.0653	0.1107	7.23	-35.40
10	4.4	0.0997	0.7284	0.0726	0.1107	8.04	-50.50
10	4.4	0.1097	0.7284	0.0799	0.1107	8.84	-65.59
10	4.4	0.1197	0.7284	0.0872	0.1107	9.65	-80.69
10	4.4	0.1297	0.7284	0.0945	0.1107	10.45	-95.78
10	4.4	0.1397	0.7284	0.1018	0.1107	11.26	-110.87
10	4.4	0.1497	0.7284	0.1090	0.1107	12.07	-125.97
10	4.4	0.1597	0.7284	0.1163	0.1107	12.87	-141.06
10	4.4	0.1697	0.7284	0.1236	0.1107	13.68	-156.16
10	4.4	0.1797	0.7284	0.1309	0.1107	14.48	-171.25
10	4.4	0.1897	0.7284	0.1382	0.1107	15.29	-186.35
10	4.4	0.1997	0.7284	0.1455	0.1107	16.10	-201.44
10	4.4	0.2097	0.7284	0.1527	0.1107	16.90	-216.54
10	4.4	0.2197	0.7284	0.1600	0.1107	17.71	-231.63
10	4.4	0.2297	0.7284	0.1673	0.1107	18.52	-246.73
10	4.4	0.2397	0.7284	0.1746	0.1107	19.32	-261.82
10	4.4	0.2497	0.7284	0.1819	0.1107	20.13	-276.92
10	4.4	0.2597	0.7284	0.1892	0.1107	20.93	-292.01

10	4.4	0.2697	0.7284	0.1964	0.1107	21.74	-307.11
10	4.4	0.2797	0.7284	0.2037	0.1107	22.55	-322.20
10	4.4	0.2897	0.7284	0.2110	0.1107	23.35	-337.30
10	4.4	0.2997	0.7284	0.2183	0.1107	24.16	-352.39
10	4.4	0.3097	0.7284	0.2256	0.1107	24.96	-367.49
10	4.4	0.3197	0.7284	0.2329	0.1107	25.77	-382.58
10	4.4	0.3297	0.7284	0.2401	0.1107	26.58	-397.68
10	4.4	0.3397	0.7284	0.2474	0.1107	27.38	-412.77
10	4.4	0.3497	0.7284	0.2547	0.1107	28.19	-427.87
10	4.4	0.3597	0.7284	0.2620	0.1107	28.99	-442.96
10	4.4	0.3697	0.7284	0.2693	0.1107	29.80	-458.06
10	4.4	0.3797	0.7284	0.2766	0.1107	30.61	-473.15
10	4.4	0.3897	0.7284	0.2838	0.1107	31.41	-488.25
10	4.4	0.3997	0.7284	0.2911	0.1107	32.22	-503.34
10	4.4	0.4097	0.7284	0.2984	0.1107	33.02	-518.44
10	4.4	0.4197	0.7284	0.3057	0.1107	33.83	-533.53
10	4.4	0.4297	0.7284	0.3130	0.1107	34.64	-548.63
10	4.4	0.4397	0.7284	0.3203	0.1107	35.44	-563.72
10	4.4	0.4497	0.7284	0.3275	0.1107	36.25	-578.81
10	4.4	0.4597	0.7284	0.3348	0.1107	37.05	-593.91
10	4.4	0.4697	0.7284	0.3421	0.1107	37.86	-609.00
10	4.4	0.4797	0.7284	0.3494	0.1107	38.67	-624.10
10	4.4	0.4897	0.7284	0.3567	0.1107	39.47	-639.19
10	4.4	0.4997	0.7284	0.3640	0.1107	40.28	-654.29
10	4.4	0.5097	0.7284	0.3713	0.1107	41.09	-669.38
10	4.4	0.5197	0.7284	0.3785	0.1107	41.89	-684.48
10	4.4	0.5297	0.7284	0.3858	0.1107	42.70	-699.57
10	4.4	0.5397	0.7284	0.3931	0.1107	43.50	-714.67
10	4.4	0.5497	0.7284	0.4004	0.1107	44.31	-729.76
10	4.4	0.5597	0.7284	0.4077	0.1107	45.12	-744.86
10	4.4	0.5697	0.7284	0.4150	0.1107	45.92	-759.95
10	4.4	0.5797	0.7284	0.4222	0.1107	46.73	-775.05
10	4.4	0.5897	0.7284	0.4295	0.1107	47.53	-790.14
10	4.4	0.5997	0.7284	0.4368	0.1107	48.34	-805.24
10	4.4	0.6097	0.7284	0.4441	0.1107	49.15	-820.33
10	4.4	0.6197	0.7284	0.4514	0.1107	49.95	-835.43

Table B18: Range of C_d for set 1 model (Type 4c, Q = 4.40 l/s)

s (cm)	h (cm)	Cd	m	Co	X	Qt (l/s)	% Error
10	4.35	0.0597	0.7284	0.0435	0.1102	**4.79**	**-34.56**
10	4.35	0.0697	0.7284	0.0508	0.1102	5.59	-57.10
10	4.35	0.0797	0.7284	0.0581	0.1102	6.40	-79.64
10	4.35	0.0897	0.7284	0.0653	0.1102	7.20	-102.18

10	4.35	0.0997	0.7284	0.0726	0.1102	8.00	-124.72
10	4.35	0.1097	0.7284	0.0799	0.1102	8.80	-147.26
10	4.35	0.1197	0.7284	0.0872	0.1102	9.60	-169.80
10	4.35	0.1297	0.7284	0.0945	0.1102	10.41	-192.34
10	4.35	0.1397	0.7284	0.1018	0.1102	11.21	-214.88
10	4.35	0.1497	0.7284	0.1090	0.1102	12.01	-237.42
10	4.35	0.1597	0.7284	0.1163	0.1102	12.81	-259.96
10	4.35	0.1697	0.7284	0.1236	0.1102	13.62	-282.50
10	4.35	0.1797	0.7284	0.1309	0.1102	14.42	-305.04
10	4.35	0.1897	0.7284	0.1382	0.1102	15.22	-327.58
10	4.35	0.1997	0.7284	0.1455	0.1102	16.02	-350.12
10	4.35	0.2097	0.7284	0.1527	0.1102	16.83	-372.66
10	4.35	0.2197	0.7284	0.1600	0.1102	17.63	-395.20
10	4.35	0.2297	0.7284	0.1673	0.1102	18.43	-417.74
10	4.35	0.2397	0.7284	0.1746	0.1102	19.23	-440.28
10	4.35	0.2497	0.7284	0.1819	0.1102	20.04	-462.82
10	4.35	0.2597	0.7284	0.1892	0.1102	20.84	-485.36
10	4.35	0.2697	0.7284	0.1964	0.1102	21.64	-507.90
10	4.35	0.2797	0.7284	0.2037	0.1102	22.44	-530.44
10	4.35	0.2897	0.7284	0.2110	0.1102	23.25	-552.98
10	4.35	0.2997	0.7284	0.2183	0.1102	24.05	-575.52
10	4.35	0.3097	0.7284	0.2256	0.1102	24.85	-598.06
10	4.35	0.3197	0.7284	0.2329	0.1102	25.65	-620.60
10	4.35	0.3297	0.7284	0.2401	0.1102	26.46	-643.14
10	4.35	0.3397	0.7284	0.2474	0.1102	27.26	-665.68
10	4.35	0.3497	0.7284	0.2547	0.1102	28.06	-688.22
10	4.35	0.3597	0.7284	0.2620	0.1102	28.86	-710.76
10	4.35	0.3697	0.7284	0.2693	0.1102	29.67	-733.30
10	4.35	0.3797	0.7284	0.2766	0.1102	30.47	-755.84
10	4.35	0.3897	0.7284	0.2838	0.1102	31.27	-778.38
10	4.35	0.3997	0.7284	0.2911	0.1102	32.07	-800.92
10	4.35	0.4097	0.7284	0.2984	0.1102	32.88	-823.46
10	4.35	0.4197	0.7284	0.3057	0.1102	33.68	-846.00
10	4.35	0.4297	0.7284	0.3130	0.1102	34.48	-868.54
10	4.35	0.4397	0.7284	0.3203	0.1102	35.28	-891.08
10	4.35	0.4497	0.7284	0.3275	0.1102	36.08	-913.62
10	4.35	0.4597	0.7284	0.3348	0.1102	36.89	-936.16
10	4.35	0.4697	0.7284	0.3421	0.1102	37.69	-958.70
10	4.35	0.4797	0.7284	0.3494	0.1102	38.49	-981.24
10	4.35	0.4897	0.7284	0.3567	0.1102	39.29	-1003.78
10	4.35	0.4997	0.7284	0.3640	0.1102	40.10	-1026.32
10	4.35	0.5097	0.7284	0.3713	0.1102	40.90	-1048.86
10	4.35	0.5197	0.7284	0.3785	0.1102	41.70	-1071.40
10	4.35	0.5297	0.7284	0.3858	0.1102	42.50	-1093.94
10	4.35	0.5397	0.7284	0.3931	0.1102	43.31	-1116.48
10	4.35	0.5497	0.7284	0.4004	0.1102	44.11	-1139.02

10	4.35	0.5597	0.7284	0.4077	0.1102	44.91	-1161.56
10	4.35	0.5697	0.7284	0.4150	0.1102	45.71	-1184.10
10	4.35	0.5797	0.7284	0.4222	0.1102	46.52	-1206.64
10	4.35	0.5897	0.7284	0.4295	0.1102	47.32	-1229.18
10	4.35	0.5997	0.7284	0.4368	0.1102	48.12	-1251.72
10	4.35	0.6097	0.7284	0.4441	0.1102	48.92	-1274.26
10	4.35	0.6197	0.7284	0.4514	0.1102	49.73	-1296.80

Table B19: Range of C_d for set 1 model (Type 4d, Q = 3.56l/s)

s (cm)	h (cm)	Cd	m	Co	X	Qt (l/s)	% Error
10	4.3	0.0597	0.7284	0.0435	0.1097	**4.77**	**-60.02**
10	4.3	0.0697	0.7284	0.0508	0.1097	5.57	-86.83
10	4.3	0.0797	0.7284	0.0581	0.1097	6.37	-113.63
10	4.3	0.0897	0.7284	0.0653	0.1097	7.17	-140.44
10	4.3	0.0997	0.7284	0.0726	0.1097	7.96	-167.24
10	4.3	0.1097	0.7284	0.0799	0.1097	8.76	-194.05
10	4.3	0.1197	0.7284	0.0872	0.1097	9.56	-220.85
10	4.3	0.1297	0.7284	0.0945	0.1097	10.36	-247.66
10	4.3	0.1397	0.7284	0.1018	0.1097	11.16	-274.46
10	4.3	0.1497	0.7284	0.1090	0.1097	11.96	-301.27
10	4.3	0.1597	0.7284	0.1163	0.1097	12.76	-328.07
10	4.3	0.1697	0.7284	0.1236	0.1097	13.56	-354.88
10	4.3	0.1797	0.7284	0.1309	0.1097	14.35	-381.68
10	4.3	0.1897	0.7284	0.1382	0.1097	15.15	-408.49
10	4.3	0.1997	0.7284	0.1455	0.1097	15.95	-435.29
10	4.3	0.2097	0.7284	0.1527	0.1097	16.75	-462.09
10	4.3	0.2197	0.7284	0.1600	0.1097	17.55	-488.90
10	4.3	0.2297	0.7284	0.1673	0.1097	18.35	-515.70
10	4.3	0.2397	0.7284	0.1746	0.1097	19.15	-542.51
10	4.3	0.2497	0.7284	0.1819	0.1097	19.95	-569.31
10	4.3	0.2597	0.7284	0.1892	0.1097	20.74	-596.12
10	4.3	0.2697	0.7284	0.1964	0.1097	21.54	-622.92
10	4.3	0.2797	0.7284	0.2037	0.1097	22.34	-649.73
10	4.3	0.2897	0.7284	0.2110	0.1097	23.14	-676.53
10	4.3	0.2997	0.7284	0.2183	0.1097	23.94	-703.34
10	4.3	0.3097	0.7284	0.2256	0.1097	24.74	-730.14
10	4.3	0.3197	0.7284	0.2329	0.1097	25.54	-756.95
10	4.3	0.3297	0.7284	0.2401	0.1097	26.34	-783.75
10	4.3	0.3397	0.7284	0.2474	0.1097	27.13	-810.56
10	4.3	0.3497	0.7284	0.2547	0.1097	27.93	-837.36
10	4.3	0.3597	0.7284	0.2620	0.1097	28.73	-864.17
10	4.3	0.3697	0.7284	0.2693	0.1097	29.53	-890.97
10	4.3	0.3797	0.7284	0.2766	0.1097	30.33	-917.78

10	4.3	0.3897	0.7284	0.2838	0.1097	31.13	-944.58
10	4.3	0.3997	0.7284	0.2911	0.1097	31.93	-971.38
10	4.3	0.4097	0.7284	0.2984	0.1097	32.73	-998.19
10	4.3	0.4197	0.7284	0.3057	0.1097	33.52	-1024.99
10	4.3	0.4297	0.7284	0.3130	0.1097	34.32	-1051.80
10	4.3	0.4397	0.7284	0.3203	0.1097	35.12	-1078.60
10	4.3	0.4497	0.7284	0.3275	0.1097	35.92	-1105.41
10	4.3	0.4597	0.7284	0.3348	0.1097	36.72	-1132.21
10	4.3	0.4697	0.7284	0.3421	0.1097	37.52	-1159.02
10	4.3	0.4797	0.7284	0.3494	0.1097	38.32	-1185.82
10	4.3	0.4897	0.7284	0.3567	0.1097	39.12	-1212.63
10	4.3	0.4997	0.7284	0.3640	0.1097	39.92	-1239.43
10	4.3	0.5097	0.7284	0.3713	0.1097	40.71	-1266.24
10	4.3	0.5197	0.7284	0.3785	0.1097	41.51	-1293.04
10	4.3	0.5297	0.7284	0.3858	0.1097	42.31	-1319.85
10	4.3	0.5397	0.7284	0.3931	0.1097	43.11	-1346.65
10	4.3	0.5497	0.7284	0.4004	0.1097	43.91	-1373.46
10	4.3	0.5597	0.7284	0.4077	0.1097	44.71	-1400.26
10	4.3	0.5697	0.7284	0.4150	0.1097	45.51	-1427.06
10	4.3	0.5797	0.7284	0.4222	0.1097	46.31	-1453.87
10	4.3	0.5897	0.7284	0.4295	0.1097	47.10	-1480.67
10	4.3	0.5997	0.7284	0.4368	0.1097	47.90	-1507.48
10	4.3	0.6097	0.7284	0.4441	0.1097	48.70	-1534.28
10	4.3	0.6197	0.7284	0.4514	0.1097	49.50	-1561.09

Table B20: Range of C_d for set 1 model (Type 4e, Q_a = 2.98 l/s)

s (cm)	h (cm)	Cd	m	Co	X	Qt (l/s)	% Error
10	4.3	0.0597	0.7284	0.0435	0.1097	**4.77**	**-60.02**
10	4.3	0.0697	0.7284	0.0508	0.1097	5.57	-86.83
10	4.3	0.0797	0.7284	0.0581	0.1097	6.37	-113.63
10	4.3	0.0897	0.7284	0.0653	0.1097	7.17	-140.44
10	4.3	0.0997	0.7284	0.0726	0.1097	7.96	-167.24
10	4.3	0.1097	0.7284	0.0799	0.1097	8.76	-194.05
10	4.3	0.1197	0.7284	0.0872	0.1097	9.56	-220.85
10	4.3	0.1297	0.7284	0.0945	0.1097	10.36	-247.66
10	4.3	0.1397	0.7284	0.1018	0.1097	11.16	-274.46
10	4.3	0.1497	0.7284	0.1090	0.1097	11.96	-301.27
10	4.3	0.1597	0.7284	0.1163	0.1097	12.76	-328.07
10	4.3	0.1697	0.7284	0.1236	0.1097	13.56	-354.88
10	4.3	0.1797	0.7284	0.1309	0.1097	14.35	-381.68
10	4.3	0.1897	0.7284	0.1382	0.1097	15.15	-408.49
10	4.3	0.1997	0.7284	0.1455	0.1097	15.95	-435.29
10	4.3	0.2097	0.7284	0.1527	0.1097	16.75	-462.09

10	4.3	0.2197	0.7284	0.1600	0.1097	17.55	-488.90
10	4.3	0.2297	0.7284	0.1673	0.1097	18.35	-515.70
10	4.3	0.2397	0.7284	0.1746	0.1097	19.15	-542.51
10	4.3	0.2497	0.7284	0.1819	0.1097	19.95	-569.31
10	4.3	0.2597	0.7284	0.1892	0.1097	20.74	-596.12
10	4.3	0.2697	0.7284	0.1964	0.1097	21.54	-622.92
10	4.3	0.2797	0.7284	0.2037	0.1097	22.34	-649.73
10	4.3	0.2897	0.7284	0.2110	0.1097	23.14	-676.53
10	4.3	0.2997	0.7284	0.2183	0.1097	23.94	-703.34
10	4.3	0.3097	0.7284	0.2256	0.1097	24.74	-730.14
10	4.3	0.3197	0.7284	0.2329	0.1097	25.54	-756.95
10	4.3	0.3297	0.7284	0.2401	0.1097	26.34	-783.75
10	4.3	0.3397	0.7284	0.2474	0.1097	27.13	-810.56
10	4.3	0.3497	0.7284	0.2547	0.1097	27.93	-837.36
10	4.3	0.3597	0.7284	0.2620	0.1097	28.73	-864.17
10	4.3	0.3697	0.7284	0.2693	0.1097	29.53	-890.97
10	4.3	0.3797	0.7284	0.2766	0.1097	30.33	-917.78
10	4.3	0.3897	0.7284	0.2838	0.1097	31.13	-944.58
10	4.3	0.3997	0.7284	0.2911	0.1097	31.93	-971.38
10	4.3	0.4097	0.7284	0.2984	0.1097	32.73	-998.19
10	4.3	0.4197	0.7284	0.3057	0.1097	33.52	-1024.99
10	4.3	0.4297	0.7284	0.3130	0.1097	34.32	-1051.80
10	4.3	0.4397	0.7284	0.3203	0.1097	35.12	-1078.60
10	4.3	0.4497	0.7284	0.3275	0.1097	35.92	-1105.41
10	4.3	0.4597	0.7284	0.3348	0.1097	36.72	-1132.21
10	4.3	0.4697	0.7284	0.3421	0.1097	37.52	-1159.02
10	4.3	0.4797	0.7284	0.3494	0.1097	38.32	-1185.82
10	4.3	0.4897	0.7284	0.3567	0.1097	39.12	-1212.63
10	4.3	0.4997	0.7284	0.3640	0.1097	39.92	-1239.43
10	4.3	0.5097	0.7284	0.3713	0.1097	40.71	-1266.24
10	4.3	0.5197	0.7284	0.3785	0.1097	41.51	-1293.04
10	4.3	0.5297	0.7284	0.3858	0.1097	42.31	-1319.85
10	4.3	0.5397	0.7284	0.3931	0.1097	43.11	-1346.65
10	4.3	0.5497	0.7284	0.4004	0.1097	43.91	-1373.46
10	4.3	0.5597	0.7284	0.4077	0.1097	44.71	-1400.26
10	4.3	0.5697	0.7284	0.4150	0.1097	45.51	-1427.06
10	4.3	0.5797	0.7284	0.4222	0.1097	46.31	-1453.87
10	4.3	0.5897	0.7284	0.4295	0.1097	47.10	-1480.67
10	4.3	0.5997	0.7284	0.4368	0.1097	47.90	-1507.48
10	4.3	0.6097	0.7284	0.4441	0.1097	48.70	-1534.28
10	4.3	0.6197	0.7284	0.4514	0.1097	49.50	-1561.09

Table B21: Range of C_d for set 1 model (Type 5a, Q_a = 6.24 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
12	4.5	0.0597	0.7979	0.0476	0.1250	**5.95**	**4.58**
12	4.5	0.0697	0.7979	0.0556	0.1250	6.95	-11.40
12	4.5	0.0797	0.7979	0.0636	0.1250	7.95	-27.39
12	4.5	0.0897	0.7979	0.0716	0.1250	8.95	-43.37
12	4.5	0.0997	0.7979	0.0795	0.1250	9.94	-59.35
12	4.5	0.1097	0.7979	0.0875	0.1250	10.94	-75.34
12	4.5	0.1197	0.7979	0.0955	0.1250	11.94	-91.32
12	4.5	0.1297	0.7979	0.1035	0.1250	12.94	-107.30
12	4.5	0.1397	0.7979	0.1115	0.1250	13.93	-123.29
12	4.5	0.1497	0.7979	0.1194	0.1250	14.93	-139.27
12	4.5	0.1597	0.7979	0.1274	0.1250	15.93	-155.25
12	4.5	0.1697	0.7979	0.1354	0.1250	16.93	-171.24
12	4.5	0.1797	0.7979	0.1434	0.1250	17.92	-187.22
12	4.5	0.1897	0.7979	0.1514	0.1250	18.92	-203.20
12	4.5	0.1997	0.7979	0.1593	0.1250	19.92	-219.19
12	4.5	0.2097	0.7979	0.1673	0.1250	20.91	-235.17
12	4.5	0.2197	0.7979	0.1753	0.1250	21.91	-251.16
12	4.5	0.2297	0.7979	0.1833	0.1250	22.91	-267.14
12	4.5	0.2397	0.7979	0.1913	0.1250	23.91	-283.12
12	4.5	0.2497	0.7979	0.1992	0.1250	24.90	-299.11
12	4.5	0.2597	0.7979	0.2072	0.1250	25.90	-315.09
12	4.5	0.2697	0.7979	0.2152	0.1250	26.90	-331.07
12	4.5	0.2797	0.7979	0.2232	0.1250	27.90	-347.06
12	4.5	0.2897	0.7979	0.2311	0.1250	28.89	-363.04
12	4.5	0.2997	0.7979	0.2391	0.1250	29.89	-379.02
12	4.5	0.3097	0.7979	0.2471	0.1250	30.89	-395.01
12	4.5	0.3197	0.7979	0.2551	0.1250	31.89	-410.99
12	4.5	0.3297	0.7979	0.2631	0.1250	32.88	-426.97
12	4.5	0.3397	0.7979	0.2710	0.1250	33.88	-442.96
12	4.5	0.3497	0.7979	0.2790	0.1250	34.88	-458.94
12	4.5	0.3597	0.7979	0.2870	0.1250	35.88	-474.92
12	4.5	0.3697	0.7979	0.2950	0.1250	36.87	-490.91
12	4.5	0.3797	0.7979	0.3030	0.1250	37.87	-506.89
12	4.5	0.3897	0.7979	0.3109	0.1250	38.87	-522.87
12	4.5	0.3997	0.7979	0.3189	0.1250	39.86	-538.86
12	4.5	0.4097	0.7979	0.3269	0.1250	40.86	-554.84
12	4.5	0.4197	0.7979	0.3349	0.1250	41.86	-570.82
12	4.5	0.4297	0.7979	0.3429	0.1250	42.86	-586.81
12	4.5	0.4397	0.7979	0.3508	0.1250	43.85	-602.79
12	4.5	0.4497	0.7979	0.3588	0.1250	44.85	-618.77
12	4.5	0.4597	0.7979	0.3668	0.1250	45.85	-634.76
12	4.5	0.4697	0.7979	0.3748	0.1250	46.85	-650.74
12	4.5	0.4797	0.7979	0.3827	0.1250	47.84	-666.72

12	4.5	0.4897	0.7979	0.3907	0.1250	48.84	-682.71
12	4.5	0.4997	0.7979	0.3987	0.1250	49.84	-698.69
12	4.5	0.5097	0.7979	0.4067	0.1250	50.84	-714.67
12	4.5	0.5197	0.7979	0.4147	0.1250	51.83	-730.66
12	4.5	0.5297	0.7979	0.4226	0.1250	52.83	-746.64
12	4.5	0.5397	0.7979	0.4306	0.1250	53.83	-762.62
12	4.5	0.5497	0.7979	0.4386	0.1250	54.83	-778.61
12	4.5	0.5597	0.7979	0.4466	0.1250	55.82	-794.59
12	4.5	0.5697	0.7979	0.4546	0.1250	56.82	-810.57
12	4.5	0.5797	0.7979	0.4625	0.1250	57.82	-826.56
12	4.5	0.5897	0.7979	0.4705	0.1250	58.81	-842.54
12	4.5	0.5997	0.7979	0.4785	0.1250	59.81	-858.52
12	4.5	0.6097	0.7979	0.4865	0.1250	60.81	-874.51
12	4.5	0.6197	0.7979	0.4945	0.1250	61.81	-890.49

Table B22: Range of C_d for set 1 model (Type 5b, Q_a = 5.34 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
12	4.5	0.0597	0.7979	0.0476	0.1250	**5.95**	**-11.50**
12	4.5	0.0697	0.7979	0.0556	0.1250	6.95	-30.18
12	4.5	0.0797	0.7979	0.0636	0.1250	7.95	-48.86
12	4.5	0.0897	0.7979	0.0716	0.1250	8.95	-67.53
12	4.5	0.0997	0.7979	0.0795	0.1250	9.94	-86.21
12	4.5	0.1097	0.7979	0.0875	0.1250	10.94	-104.89
12	4.5	0.1197	0.7979	0.0955	0.1250	11.94	-123.57
12	4.5	0.1297	0.7979	0.1035	0.1250	12.94	-142.24
12	4.5	0.1397	0.7979	0.1115	0.1250	13.93	-160.92
12	4.5	0.1497	0.7979	0.1194	0.1250	14.93	-179.60
12	4.5	0.1597	0.7979	0.1274	0.1250	15.93	-198.28
12	4.5	0.1697	0.7979	0.1354	0.1250	16.93	-216.95
12	4.5	0.1797	0.7979	0.1434	0.1250	17.92	-235.63
12	4.5	0.1897	0.7979	0.1514	0.1250	18.92	-254.31
12	4.5	0.1997	0.7979	0.1593	0.1250	19.92	-272.98
12	4.5	0.2097	0.7979	0.1673	0.1250	20.91	-291.66
12	4.5	0.2197	0.7979	0.1753	0.1250	21.91	-310.34
12	4.5	0.2297	0.7979	0.1833	0.1250	22.91	-329.02
12	4.5	0.2397	0.7979	0.1913	0.1250	23.91	-347.69
12	4.5	0.2497	0.7979	0.1992	0.1250	24.90	-366.37
12	4.5	0.2597	0.7979	0.2072	0.1250	25.90	-385.05
12	4.5	0.2697	0.7979	0.2152	0.1250	26.90	-403.72
12	4.5	0.2797	0.7979	0.2232	0.1250	27.90	-422.40
12	4.5	0.2897	0.7979	0.2311	0.1250	28.89	-441.08
12	4.5	0.2997	0.7979	0.2391	0.1250	29.89	-459.76
12	4.5	0.3097	0.7979	0.2471	0.1250	30.89	-478.43

12	4.5	0.3197	0.7979	0.2551	0.1250	31.89	-497.11
12	4.5	0.3297	0.7979	0.2631	0.1250	32.88	-515.79
12	4.5	0.3397	0.7979	0.2710	0.1250	33.88	-534.47
12	4.5	0.3497	0.7979	0.2790	0.1250	34.88	-553.14
12	4.5	0.3597	0.7979	0.2870	0.1250	35.88	-571.82
12	4.5	0.3697	0.7979	0.2950	0.1250	36.87	-590.50
12	4.5	0.3797	0.7979	0.3030	0.1250	37.87	-609.17
12	4.5	0.3897	0.7979	0.3109	0.1250	38.87	-627.85
12	4.5	0.3997	0.7979	0.3189	0.1250	39.86	-646.53
12	4.5	0.4097	0.7979	0.3269	0.1250	40.86	-665.21
12	4.5	0.4197	0.7979	0.3349	0.1250	41.86	-683.88
12	4.5	0.4297	0.7979	0.3429	0.1250	42.86	-702.56
12	4.5	0.4397	0.7979	0.3508	0.1250	43.85	-721.24
12	4.5	0.4497	0.7979	0.3588	0.1250	44.85	-739.91
12	4.5	0.4597	0.7979	0.3668	0.1250	45.85	-758.59
12	4.5	0.4697	0.7979	0.3748	0.1250	46.85	-777.27
12	4.5	0.4797	0.7979	0.3827	0.1250	47.84	-795.95
12	4.5	0.4897	0.7979	0.3907	0.1250	48.84	-814.62
12	4.5	0.4997	0.7979	0.3987	0.1250	49.84	-833.30
12	4.5	0.5097	0.7979	0.4067	0.1250	50.84	-851.98
12	4.5	0.5197	0.7979	0.4147	0.1250	51.83	-870.66
12	4.5	0.5297	0.7979	0.4226	0.1250	52.83	-889.33
12	4.5	0.5397	0.7979	0.4306	0.1250	53.83	-908.01
12	4.5	0.5497	0.7979	0.4386	0.1250	54.83	-926.69
12	4.5	0.5597	0.7979	0.4466	0.1250	55.82	-945.36
12	4.5	0.5697	0.7979	0.4546	0.1250	56.82	-964.04
12	4.5	0.5797	0.7979	0.4625	0.1250	57.82	-982.72
12	4.5	0.5897	0.7979	0.4705	0.1250	58.81	-1001.40
12	4.5	0.5997	0.7979	0.4785	0.1250	59.81	-1020.07
12	4.5	0.6097	0.7979	0.4865	0.1250	60.81	-1038.75
12	4.5	0.6197	0.7979	0.4945	0.1250	61.81	-1057.43

Table B23: Range of C_d for set 1 model (Type 5c, Q_a = 4.40 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
12	4.5	0.0597	0.7979	0.0476	0.1250	**5.95**	**-35.32**
12	4.5	0.0697	0.7979	0.0556	0.1250	6.95	-57.99
12	4.5	0.0797	0.7979	0.0636	0.1250	7.95	-80.66
12	4.5	0.0897	0.7979	0.0716	0.1250	8.95	-103.33
12	4.5	0.0997	0.7979	0.0795	0.1250	9.94	-125.99
12	4.5	0.1097	0.7979	0.0875	0.1250	10.94	-148.66
12	4.5	0.1197	0.7979	0.0955	0.1250	11.94	-171.33
12	4.5	0.1297	0.7979	0.1035	0.1250	12.94	-194.00
12	4.5	0.1397	0.7979	0.1115	0.1250	13.93	-216.66

12	4.5	0.1497	0.7979	0.1194	0.1250	14.93	-239.33
12	4.5	0.1597	0.7979	0.1274	0.1250	15.93	-262.00
12	4.5	0.1697	0.7979	0.1354	0.1250	16.93	-284.66
12	4.5	0.1797	0.7979	0.1434	0.1250	17.92	-307.33
12	4.5	0.1897	0.7979	0.1514	0.1250	18.92	-330.00
12	4.5	0.1997	0.7979	0.1593	0.1250	19.92	-352.67
12	4.5	0.2097	0.7979	0.1673	0.1250	20.91	-375.33
12	4.5	0.2197	0.7979	0.1753	0.1250	21.91	-398.00
12	4.5	0.2297	0.7979	0.1833	0.1250	22.91	-420.67
12	4.5	0.2397	0.7979	0.1913	0.1250	23.91	-443.34
12	4.5	0.2497	0.7979	0.1992	0.1250	24.90	-466.00
12	4.5	0.2597	0.7979	0.2072	0.1250	25.90	-488.67
12	4.5	0.2697	0.7979	0.2152	0.1250	26.90	-511.34
12	4.5	0.2797	0.7979	0.2232	0.1250	27.90	-534.01
12	4.5	0.2897	0.7979	0.2311	0.1250	28.89	-556.67
12	4.5	0.2997	0.7979	0.2391	0.1250	29.89	-579.34
12	4.5	0.3097	0.7979	0.2471	0.1250	30.89	-602.01
12	4.5	0.3197	0.7979	0.2551	0.1250	31.89	-624.68
12	4.5	0.3297	0.7979	0.2631	0.1250	32.88	-647.34
12	4.5	0.3397	0.7979	0.2710	0.1250	33.88	-670.01
12	4.5	0.3497	0.7979	0.2790	0.1250	34.88	-692.68
12	4.5	0.3597	0.7979	0.2870	0.1250	35.88	-715.34
12	4.5	0.3697	0.7979	0.2950	0.1250	36.87	-738.01
12	4.5	0.3797	0.7979	0.3030	0.1250	37.87	-760.68
12	4.5	0.3897	0.7979	0.3109	0.1250	38.87	-783.35
12	4.5	0.3997	0.7979	0.3189	0.1250	39.86	-806.01
12	4.5	0.4097	0.7979	0.3269	0.1250	40.86	-828.68
12	4.5	0.4197	0.7979	0.3349	0.1250	41.86	-851.35
12	4.5	0.4297	0.7979	0.3429	0.1250	42.86	-874.02
12	4.5	0.4397	0.7979	0.3508	0.1250	43.85	-896.68
12	4.5	0.4497	0.7979	0.3588	0.1250	44.85	-919.35
12	4.5	0.4597	0.7979	0.3668	0.1250	45.85	-942.02
12	4.5	0.4697	0.7979	0.3748	0.1250	46.85	-964.69
12	4.5	0.4797	0.7979	0.3827	0.1250	47.84	-987.35
12	4.5	0.4897	0.7979	0.3907	0.1250	48.84	-1010.02
12	4.5	0.4997	0.7979	0.3987	0.1250	49.84	-1032.69
12	4.5	0.5097	0.7979	0.4067	0.1250	50.84	-1055.35
12	4.5	0.5197	0.7979	0.4147	0.1250	51.83	-1078.02
12	4.5	0.5297	0.7979	0.4226	0.1250	52.83	-1100.69
12	4.5	0.5397	0.7979	0.4306	0.1250	53.83	-1123.36
12	4.5	0.5497	0.7979	0.4386	0.1250	54.83	-1146.02
12	4.5	0.5597	0.7979	0.4466	0.1250	55.82	-1168.69
12	4.5	0.5697	0.7979	0.4546	0.1250	56.82	-1191.36
12	4.5	0.5797	0.7979	0.4625	0.1250	57.82	-1214.03
12	4.5	0.5897	0.7979	0.4705	0.1250	58.81	-1236.69
12	4.5	0.5997	0.7979	0.4785	0.1250	59.81	-1259.36

12	4.5	0.6097	0.7979	0.4865	0.1250	60.81	-1282.03
12	4.5	0.6197	0.7979	0.4945	0.1250	61.81	-1304.70

Table B24: Range of C_d for set 1 model (Type 5d, Q_a = 3.56 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
12	4.4	0.0597	0.7979	0.0476	0.1240	**5.91**	**-65.92**
12	4.4	0.0697	0.7979	0.0556	0.1240	6.90	-93.71
12	4.4	0.0797	0.7979	0.0636	0.1240	7.89	-121.50
12	4.4	0.0897	0.7979	0.0716	0.1240	8.87	-149.29
12	4.4	0.0997	0.7979	0.0795	0.1240	9.86	-177.08
12	4.4	0.1097	0.7979	0.0875	0.1240	10.85	-204.87
12	4.4	0.1197	0.7979	0.0955	0.1240	11.84	-232.67
12	4.4	0.1297	0.7979	0.1035	0.1240	12.83	-260.46
12	4.4	0.1397	0.7979	0.1115	0.1240	13.82	-288.25
12	4.4	0.1497	0.7979	0.1194	0.1240	14.81	-316.04
12	4.4	0.1597	0.7979	0.1274	0.1240	15.80	-343.83
12	4.4	0.1697	0.7979	0.1354	0.1240	16.79	-371.63
12	4.4	0.1797	0.7979	0.1434	0.1240	17.78	-399.42
12	4.4	0.1897	0.7979	0.1514	0.1240	18.77	-427.21
12	4.4	0.1997	0.7979	0.1593	0.1240	19.76	-455.00
12	4.4	0.2097	0.7979	0.1673	0.1240	20.75	-482.79
12	4.4	0.2197	0.7979	0.1753	0.1240	21.74	-510.58
12	4.4	0.2297	0.7979	0.1833	0.1240	22.73	-538.38
12	4.4	0.2397	0.7979	0.1913	0.1240	23.72	-566.17
12	4.4	0.2497	0.7979	0.1992	0.1240	24.70	-593.96
12	4.4	0.2597	0.7979	0.2072	0.1240	25.69	-621.75
12	4.4	0.2697	0.7979	0.2152	0.1240	26.68	-649.54
12	4.4	0.2797	0.7979	0.2232	0.1240	27.67	-677.33
12	4.4	0.2897	0.7979	0.2311	0.1240	28.66	-705.13
12	4.4	0.2997	0.7979	0.2391	0.1240	29.65	-732.92
12	4.4	0.3097	0.7979	0.2471	0.1240	30.64	-760.71
12	4.4	0.3197	0.7979	0.2551	0.1240	31.63	-788.50
12	4.4	0.3297	0.7979	0.2631	0.1240	32.62	-816.29
12	4.4	0.3397	0.7979	0.2710	0.1240	33.61	-844.08
12	4.4	0.3497	0.7979	0.2790	0.1240	34.60	-871.88
12	4.4	0.3597	0.7979	0.2870	0.1240	35.59	-899.67
12	4.4	0.3697	0.7979	0.2950	0.1240	36.58	-927.46
12	4.4	0.3797	0.7979	0.3030	0.1240	37.57	-955.25
12	4.4	0.3897	0.7979	0.3109	0.1240	38.56	-983.04
12	4.4	0.3997	0.7979	0.3189	0.1240	39.55	-1010.83
12	4.4	0.4097	0.7979	0.3269	0.1240	40.54	-1038.63
12	4.4	0.4197	0.7979	0.3349	0.1240	41.52	-1066.42
12	4.4	0.4297	0.7979	0.3429	0.1240	42.51	-1094.21

12	4.4	0.4397	0.7979	0.3508	0.1240	43.50	-1122.00
12	4.4	0.4497	0.7979	0.3588	0.1240	44.49	-1149.79
12	4.4	0.4597	0.7979	0.3668	0.1240	45.48	-1177.58
12	4.4	0.4697	0.7979	0.3748	0.1240	46.47	-1205.38
12	4.4	0.4797	0.7979	0.3827	0.1240	47.46	-1233.17
12	4.4	0.4897	0.7979	0.3907	0.1240	48.45	-1260.96
12	4.4	0.4997	0.7979	0.3987	0.1240	49.44	-1288.75
12	4.4	0.5097	0.7979	0.4067	0.1240	50.43	-1316.54
12	4.4	0.5197	0.7979	0.4147	0.1240	51.42	-1344.33
12	4.4	0.5297	0.7979	0.4226	0.1240	52.41	-1372.13
12	4.4	0.5397	0.7979	0.4306	0.1240	53.40	-1399.92
12	4.4	0.5497	0.7979	0.4386	0.1240	54.39	-1427.71
12	4.4	0.5597	0.7979	0.4466	0.1240	55.38	-1455.50
12	4.4	0.5697	0.7979	0.4546	0.1240	56.37	-1483.29
12	4.4	0.5797	0.7979	0.4625	0.1240	57.35	-1511.09
12	4.4	0.5897	0.7979	0.4705	0.1240	58.34	-1538.88
12	4.4	0.5997	0.7979	0.4785	0.1240	59.33	-1566.67
12	4.4	0.6097	0.7979	0.4865	0.1240	60.32	-1594.46
12	4.4	0.6197	0.7979	0.4945	0.1240	61.31	-1622.25

Table B25: Range of C_d for set 1 model (Type 5e, Q_a = 2.98 l/s)

s (cm)	**h (cm)**	**Cd**	**m**	**Co**	**x**	**Qt (l/s)**	**% Error**
12	4.4	0.0597	0.7979	0.0476	0.1240	**5.91**	**-98.21**
12	4.4	0.0697	0.7979	0.0556	0.1240	6.90	-131.41
12	4.4	0.0797	0.7979	0.0636	0.1240	7.89	-164.61
12	4.4	0.0897	0.7979	0.0716	0.1240	8.87	-197.81
12	4.4	0.0997	0.7979	0.0795	0.1240	9.86	-231.01
12	4.4	0.1097	0.7979	0.0875	0.1240	10.85	-264.21
12	4.4	0.1197	0.7979	0.0955	0.1240	11.84	-297.41
12	4.4	0.1297	0.7979	0.1035	0.1240	12.83	-330.61
12	4.4	0.1397	0.7979	0.1115	0.1240	13.82	-363.82
12	4.4	0.1497	0.7979	0.1194	0.1240	14.81	-397.02
12	4.4	0.1597	0.7979	0.1274	0.1240	15.80	-430.22
12	4.4	0.1697	0.7979	0.1354	0.1240	16.79	-463.42
12	4.4	0.1797	0.7979	0.1434	0.1240	17.78	-496.62
12	4.4	0.1897	0.7979	0.1514	0.1240	18.77	-529.82
12	4.4	0.1997	0.7979	0.1593	0.1240	19.76	-563.02
12	4.4	0.2097	0.7979	0.1673	0.1240	20.75	-596.22
12	4.4	0.2197	0.7979	0.1753	0.1240	21.74	-629.42
12	4.4	0.2297	0.7979	0.1833	0.1240	22.73	-662.62
12	4.4	0.2397	0.7979	0.1913	0.1240	23.72	-695.82
12	4.4	0.2497	0.7979	0.1992	0.1240	24.70	-729.02
12	4.4	0.2597	0.7979	0.2072	0.1240	25.69	-762.23

12	4.4	0.2697	0.7979	0.2152	0.1240	26.68	-795.43
12	4.4	0.2797	0.7979	0.2232	0.1240	27.67	-828.63
12	4.4	0.2897	0.7979	0.2311	0.1240	28.66	-861.83
12	4.4	0.2997	0.7979	0.2391	0.1240	29.65	-895.03
12	4.4	0.3097	0.7979	0.2471	0.1240	30.64	-928.23
12	4.4	0.3197	0.7979	0.2551	0.1240	31.63	-961.43
12	4.4	0.3297	0.7979	0.2631	0.1240	32.62	-994.63
12	4.4	0.3397	0.7979	0.2710	0.1240	33.61	-1027.83
12	4.4	0.3497	0.7979	0.2790	0.1240	34.60	-1061.03
12	4.4	0.3597	0.7979	0.2870	0.1240	35.59	-1094.23
12	4.4	0.3697	0.7979	0.2950	0.1240	36.58	-1127.43
12	4.4	0.3797	0.7979	0.3030	0.1240	37.57	-1160.64
12	4.4	0.3897	0.7979	0.3109	0.1240	38.56	-1193.84
12	4.4	0.3997	0.7979	0.3189	0.1240	39.55	-1227.04
12	4.4	0.4097	0.7979	0.3269	0.1240	40.54	-1260.24
12	4.4	0.4197	0.7979	0.3349	0.1240	41.52	-1293.44
12	4.4	0.4297	0.7979	0.3429	0.1240	42.51	-1326.64
12	4.4	0.4397	0.7979	0.3508	0.1240	43.50	-1359.84
12	4.4	0.4497	0.7979	0.3588	0.1240	44.49	-1393.04
12	4.4	0.4597	0.7979	0.3668	0.1240	45.48	-1426.24
12	4.4	0.4697	0.7979	0.3748	0.1240	46.47	-1459.44
12	4.4	0.4797	0.7979	0.3827	0.1240	47.46	-1492.64
12	4.4	0.4897	0.7979	0.3907	0.1240	48.45	-1525.84
12	4.4	0.4997	0.7979	0.3987	0.1240	49.44	-1559.05
12	4.4	0.5097	0.7979	0.4067	0.1240	50.43	-1592.25
12	4.4	0.5197	0.7979	0.4147	0.1240	51.42	-1625.45
12	4.4	0.5297	0.7979	0.4226	0.1240	52.41	-1658.65
12	4.4	0.5397	0.7979	0.4306	0.1240	53.40	-1691.85
12	4.4	0.5497	0.7979	0.4386	0.1240	54.39	-1725.05
12	4.4	0.5597	0.7979	0.4466	0.1240	55.38	-1758.25
12	4.4	0.5697	0.7979	0.4546	0.1240	56.37	-1791.45
12	4.4	0.5797	0.7979	0.4625	0.1240	57.35	-1824.65
12	4.4	0.5897	0.7979	0.4705	0.1240	58.34	-1857.85
12	4.4	0.5997	0.7979	0.4785	0.1240	59.33	-1891.05
12	4.4	0.6097	0.7979	0.4865	0.1240	60.32	-1924.25
12	4.4	0.6197	0.7979	0.4945	0.1240	61.31	-1957.46

APPENDIX C

Table C1: Range of C_d for set 2 model (Type 21, Q_a = 6.24 l/s)

s (cm)	h (cm)	Cd	M	Co	x	Qt (l/s)	% Error
4	5.3	0.0597	0.4607	0.0275	0.0797	2.19	64.89
4	5.3	0.0697	0.4607	0.0321	0.0797	2.56	59.01
4	5.3	0.0797	0.4607	0.0367	0.0797	2.92	53.13
4	5.3	0.0897	0.4607	0.0413	0.0797	3.29	47.24
4	5.3	0.0997	0.4607	0.0459	0.0797	3.66	41.36
4	5.3	0.1097	0.4607	0.0505	0.0797	4.03	35.48
4	5.3	0.1197	0.4607	0.0551	0.0797	4.39	29.60
4	5.3	0.1297	0.4607	0.0597	0.0797	4.76	23.72
4	5.3	0.1397	0.4607	0.0644	0.0797	5.13	17.84
4	5.3	0.1497	0.4607	0.0690	0.0797	5.49	11.96
4	5.3	0.1597	0.4607	0.0736	0.0797	5.86	6.08
4	5.3	0.1697	0.4607	0.0782	0.0797	**6.23**	**0.19**
4	5.3	0.1797	0.4607	0.0828	0.0797	6.59	-5.69
4	5.3	0.1897	0.4607	0.0874	0.0797	6.96	-11.57
4	5.3	0.1997	0.4607	0.0920	0.0797	7.33	-17.45
4	5.3	0.2097	0.4607	0.0966	0.0797	7.70	-23.33
4	5.3	0.2197	0.4607	0.1012	0.0797	8.06	-29.21
4	5.3	0.2297	0.4607	0.1058	0.0797	8.43	-35.09
4	5.3	0.2397	0.4607	0.1104	0.0797	8.80	-40.98
4	5.3	0.2497	0.4607	0.1150	0.0797	9.16	-46.86
4	5.3	0.2597	0.4607	0.1196	0.0797	9.53	-52.74
4	5.3	0.2697	0.4607	0.1242	0.0797	9.90	-58.62
4	5.3	0.2797	0.4607	0.1288	0.0797	10.26	-64.50
4	5.3	0.2897	0.4607	0.1335	0.0797	10.63	-70.38
4	5.3	0.2997	0.4607	0.1381	0.0797	11.00	-76.26
4	5.3	0.3097	0.4607	0.1427	0.0797	11.37	-82.14
4	5.3	0.3197	0.4607	0.1473	0.0797	11.73	-88.03
4	5.3	0.3297	0.4607	0.1519	0.0797	12.10	-93.91
4	5.3	0.3397	0.4607	0.1565	0.0797	12.47	-99.79
4	5.3	0.3497	0.4607	0.1611	0.0797	12.83	-105.67
4	5.3	0.3597	0.4607	0.1657	0.0797	13.20	-111.55
4	5.3	0.3697	0.4607	0.1703	0.0797	13.57	-117.43
4	5.3	0.3797	0.4607	0.1749	0.0797	13.93	-123.31
4	5.3	0.3897	0.4607	0.1795	0.0797	14.30	-129.20
4	5.3	0.3997	0.4607	0.1841	0.0797	14.67	-135.08
4	5.3	0.4097	0.4607	0.1887	0.0797	15.04	-140.96
4	5.3	0.4197	0.4607	0.1933	0.0797	15.40	-146.84
4	5.3	0.4297	0.4607	0.1979	0.0797	15.77	-152.72
4	5.3	0.4397	0.4607	0.2026	0.0797	16.14	-158.60
4	5.3	0.4497	0.4607	0.2072	0.0797	16.50	-164.48

4	5.3	0.4597	0.4607	0.2118	0.0797	16.87	-170.36
4	5.3	0.4697	0.4607	0.2164	0.0797	17.24	-176.25
4	5.3	0.4797	0.4607	0.2210	0.0797	17.60	-182.13
4	5.3	0.4897	0.4607	0.2256	0.0797	17.97	-188.01
4	5.3	0.4997	0.4607	0.2302	0.0797	18.34	-193.89
4	5.3	0.5097	0.4607	0.2348	0.0797	18.71	-199.77
4	5.3	0.5197	0.4607	0.2394	0.0797	19.07	-205.65
4	5.3	0.5297	0.4607	0.2440	0.0797	19.44	-211.53
4	5.3	0.5397	0.4607	0.2486	0.0797	19.81	-217.41
4	5.3	0.5497	0.4607	0.2532	0.0797	20.17	-223.30
4	5.3	0.5597	0.4607	0.2578	0.0797	20.54	-229.18
4	5.3	0.5697	0.4607	0.2624	0.0797	20.91	-235.06
4	5.3	0.5797	0.4607	0.2670	0.0797	21.27	-240.94
4	5.3	0.5897	0.4607	0.2717	0.0797	21.64	-246.82
4	5.3	0.5997	0.4607	0.2763	0.0797	22.01	-252.70
4	5.3	0.6097	0.4607	0.2809	0.0797	22.38	-258.58
4	5.3	0.6197	0.4607	0.2855	0.0797	22.74	-264.47

Table C2: Range of C_d for set 2 model (Type 22, Q_a = 5.34 l/s)

s (cm)	h (cm)	Cd	M	Co	x	Qt (l/s)	% Error
4	4.93	0.0597	0.4607	0.0275	0.0760	2.09	60.88
4	4.93	0.0697	0.4607	0.0321	0.0760	2.44	54.32
4	4.93	0.0797	0.4607	0.0367	0.0760	2.79	47.77
4	4.93	0.0897	0.4607	0.0413	0.0760	3.14	41.22
4	4.93	0.0997	0.4607	0.0459	0.0760	3.49	34.66
4	4.93	0.1097	0.4607	0.0505	0.0760	3.84	28.11
4	4.93	0.1197	0.4607	0.0551	0.0760	4.19	21.56
4	4.93	0.1297	0.4607	0.0597	0.0760	4.54	15.00
4	4.93	0.1397	0.4607	0.0644	0.0760	4.89	8.45
4	4.93	0.1497	0.4607	0.0690	0.0760	**5.24**	**1.90**
4	4.93	0.1597	0.4607	0.0736	0.0760	5.59	-4.66
4	4.93	0.1697	0.4607	0.0782	0.0760	5.94	-11.21
4	4.93	0.1797	0.4607	0.0828	0.0760	6.29	-17.76
4	4.93	0.1897	0.4607	0.0874	0.0760	6.64	-24.32
4	4.93	0.1997	0.4607	0.0920	0.0760	6.99	-30.87
4	4.93	0.2097	0.4607	0.0966	0.0760	7.34	-37.42
4	4.93	0.2197	0.4607	0.1012	0.0760	7.69	-43.98
4	4.93	0.2297	0.4607	0.1058	0.0760	8.04	-50.53
4	4.93	0.2397	0.4607	0.1104	0.0760	8.39	-57.08
4	4.93	0.2497	0.4607	0.1150	0.0760	8.74	-63.64
4	4.93	0.2597	0.4607	0.1196	0.0760	9.09	-70.19
4	4.93	0.2697	0.4607	0.1242	0.0760	9.44	-76.74
4	4.93	0.2797	0.4607	0.1288	0.0760	9.79	-83.30

4	4.93	0.2897	0.4607	0.1335	0.0760	10.14	-89.85
4	4.93	0.2997	0.4607	0.1381	0.0760	10.49	-96.40
4	4.93	0.3097	0.4607	0.1427	0.0760	10.84	-102.96
4	4.93	0.3197	0.4607	0.1473	0.0760	11.19	-109.51
4	4.93	0.3297	0.4607	0.1519	0.0760	11.54	-116.06
4	4.93	0.3397	0.4607	0.1565	0.0760	11.89	-122.62
4	4.93	0.3497	0.4607	0.1611	0.0760	12.24	-129.17
4	4.93	0.3597	0.4607	0.1657	0.0760	12.59	-135.72
4	4.93	0.3697	0.4607	0.1703	0.0760	12.94	-142.28
4	4.93	0.3797	0.4607	0.1749	0.0760	13.29	-148.83
4	4.93	0.3897	0.4607	0.1795	0.0760	13.64	-155.38
4	4.93	0.3997	0.4607	0.1841	0.0760	13.99	-161.94
4	4.93	0.4097	0.4607	0.1887	0.0760	14.34	-168.49
4	4.93	0.4197	0.4607	0.1933	0.0760	14.69	-175.04
4	4.93	0.4297	0.4607	0.1979	0.0760	15.04	-181.60
4	4.93	0.4397	0.4607	0.2026	0.0760	15.39	-188.15
4	4.93	0.4497	0.4607	0.2072	0.0760	15.74	-194.71
4	4.93	0.4597	0.4607	0.2118	0.0760	16.09	-201.26
4	4.93	0.4697	0.4607	0.2164	0.0760	16.44	-207.81
4	4.93	0.4797	0.4607	0.2210	0.0760	16.79	-214.37
4	4.93	0.4897	0.4607	0.2256	0.0760	17.14	-220.92
4	4.93	0.4997	0.4607	0.2302	0.0760	17.49	-227.47
4	4.93	0.5097	0.4607	0.2348	0.0760	17.84	-234.03
4	4.93	0.5197	0.4607	0.2394	0.0760	18.19	-240.58
4	4.93	0.5297	0.4607	0.2440	0.0760	18.54	-247.13
4	4.93	0.5397	0.4607	0.2486	0.0760	18.89	-253.69
4	4.93	0.5497	0.4607	0.2532	0.0760	19.24	-260.24
4	4.93	0.5597	0.4607	0.2578	0.0760	19.59	-266.79
4	4.93	0.5697	0.4607	0.2624	0.0760	19.94	-273.35
4	4.93	0.5797	0.4607	0.2670	0.0760	20.29	-279.90
4	4.93	0.5897	0.4607	0.2717	0.0760	20.64	-286.45
4	4.93	0.5997	0.4607	0.2763	0.0760	20.99	-293.01
4	4.93	0.6097	0.4607	0.2809	0.0760	21.34	-299.56
4	4.93	0.6197	0.4607	0.2855	0.0760	21.69	-306.11

Table C3: Range of C_d for set 2 model (Type 23, Q_a = 4.40 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	4.5	0.0597	0.4607	0.0275	0.0717	1.97	55.21
4	4.5	0.0697	0.4607	0.0321	0.0717	2.30	47.70
4	4.5	0.0797	0.4607	0.0367	0.0717	2.63	40.20
4	4.5	0.0897	0.4607	0.0413	0.0717	2.96	32.70
4	4.5	0.0997	0.4607	0.0459	0.0717	3.29	25.19
4	4.5	0.1097	0.4607	0.0505	0.0717	3.62	17.69

4	4.5	0.1197	0.4607	0.0551	0.0717	3.95	10.19
4	4.5	0.1297	0.4607	0.0597	0.0717	**4.28**	**2.68**
4	4.5	0.1397	0.4607	0.0644	0.0717	4.61	-4.82
4	4.5	0.1497	0.4607	0.0690	0.0717	4.94	-12.32
4	4.5	0.1597	0.4607	0.0736	0.0717	5.27	-19.83
4	4.5	0.1697	0.4607	0.0782	0.0717	5.60	-27.33
4	4.5	0.1797	0.4607	0.0828	0.0717	5.93	-34.83
4	4.5	0.1897	0.4607	0.0874	0.0717	6.26	-42.34
4	4.5	0.1997	0.4607	0.0920	0.0717	6.59	-49.84
4	4.5	0.2097	0.4607	0.0966	0.0717	6.92	-57.34
4	4.5	0.2197	0.4607	0.1012	0.0717	7.25	-64.85
4	4.5	0.2297	0.4607	0.1058	0.0717	7.58	-72.35
4	4.5	0.2397	0.4607	0.1104	0.0717	7.91	-79.85
4	4.5	0.2497	0.4607	0.1150	0.0717	8.24	-87.36
4	4.5	0.2597	0.4607	0.1196	0.0717	8.57	-94.86
4	4.5	0.2697	0.4607	0.1242	0.0717	8.90	-102.36
4	4.5	0.2797	0.4607	0.1288	0.0717	9.23	-109.86
4	4.5	0.2897	0.4607	0.1335	0.0717	9.56	-117.37
4	4.5	0.2997	0.4607	0.1381	0.0717	9.89	-124.87
4	4.5	0.3097	0.4607	0.1427	0.0717	10.22	-132.37
4	4.5	0.3197	0.4607	0.1473	0.0717	10.55	-139.88
4	4.5	0.3297	0.4607	0.1519	0.0717	10.88	-147.38
4	4.5	0.3397	0.4607	0.1565	0.0717	11.21	-154.88
4	4.5	0.3497	0.4607	0.1611	0.0717	11.55	-162.39
4	4.5	0.3597	0.4607	0.1657	0.0717	11.88	-169.89
4	4.5	0.3697	0.4607	0.1703	0.0717	12.21	-177.39
4	4.5	0.3797	0.4607	0.1749	0.0717	12.54	-184.90
4	4.5	0.3897	0.4607	0.1795	0.0717	12.87	-192.40
4	4.5	0.3997	0.4607	0.1841	0.0717	13.20	-199.90
4	4.5	0.4097	0.4607	0.1887	0.0717	13.53	-207.41
4	4.5	0.4197	0.4607	0.1933	0.0717	13.86	-214.91
4	4.5	0.4297	0.4607	0.1979	0.0717	14.19	-222.41
4	4.5	0.4397	0.4607	0.2026	0.0717	14.52	-229.92
4	4.5	0.4497	0.4607	0.2072	0.0717	14.85	-237.42
4	4.5	0.4597	0.4607	0.2118	0.0717	15.18	-244.92
4	4.5	0.4697	0.4607	0.2164	0.0717	15.51	-252.43
4	4.5	0.4797	0.4607	0.2210	0.0717	15.84	-259.93
4	4.5	0.4897	0.4607	0.2256	0.0717	16.17	-267.43
4	4.5	0.4997	0.4607	0.2302	0.0717	16.50	-274.94
4	4.5	0.5097	0.4607	0.2348	0.0717	16.83	-282.44
4	4.5	0.5197	0.4607	0.2394	0.0717	17.16	-289.94
4	4.5	0.5297	0.4607	0.2440	0.0717	17.49	-297.45
4	4.5	0.5397	0.4607	0.2486	0.0717	17.82	-304.95
4	4.5	0.5497	0.4607	0.2532	0.0717	18.15	-312.45
4	4.5	0.5597	0.4607	0.2578	0.0717	18.48	-319.95
4	4.5	0.5697	0.4607	0.2624	0.0717	18.81	-327.46

4	4.5	0.5797	0.4607	0.2670	0.0717	19.14	-334.96
4	4.5	0.5897	0.4607	0.2717	0.0717	19.47	-342.46
4	4.5	0.5997	0.4607	0.2763	0.0717	19.80	-349.97
4	4.5	0.6097	0.4607	0.2809	0.0717	20.13	-357.47
4	4.5	0.6197	0.4607	0.2855	0.0717	20.46	-364.97

Table C4: Range of C_d for set 2 model (Type 24, Q_a = 3.56 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	4.2	0.0597	0.4607	0.0275	0.0687	1.89	46.95
4	4.2	0.0697	0.4607	0.0321	0.0687	2.20	38.07
4	4.2	0.0797	0.4607	0.0367	0.0687	2.52	29.18
4	4.2	0.0897	0.4607	0.0413	0.0687	2.84	20.30
4	4.2	0.0997	0.4607	0.0459	0.0687	3.15	11.41
4	4.2	0.1097	0.4607	0.0505	0.0687	**3.47**	**2.53**
4	4.2	0.1197	0.4607	0.0551	0.0687	3.79	-6.36
4	4.2	0.1297	0.4607	0.0597	0.0687	4.10	-15.24
4	4.2	0.1397	0.4607	0.0644	0.0687	4.42	-24.13
4	4.2	0.1497	0.4607	0.0690	0.0687	4.74	-33.01
4	4.2	0.1597	0.4607	0.0736	0.0687	5.05	-41.90
4	4.2	0.1697	0.4607	0.0782	0.0687	5.37	-50.79
4	4.2	0.1797	0.4607	0.0828	0.0687	5.68	-59.67
4	4.2	0.1897	0.4607	0.0874	0.0687	6.00	-68.56
4	4.2	0.1997	0.4607	0.0920	0.0687	6.32	-77.44
4	4.2	0.2097	0.4607	0.0966	0.0687	6.63	-86.33
4	4.2	0.2197	0.4607	0.1012	0.0687	6.95	-95.21
4	4.2	0.2297	0.4607	0.1058	0.0687	7.27	-104.10
4	4.2	0.2397	0.4607	0.1104	0.0687	7.58	-112.98
4	4.2	0.2497	0.4607	0.1150	0.0687	7.90	-121.87
4	4.2	0.2597	0.4607	0.1196	0.0687	8.21	-130.75
4	4.2	0.2697	0.4607	0.1242	0.0687	8.53	-139.64
4	4.2	0.2797	0.4607	0.1288	0.0687	8.85	-148.53
4	4.2	0.2897	0.4607	0.1335	0.0687	9.16	-157.41
4	4.2	0.2997	0.4607	0.1381	0.0687	9.48	-166.30
4	4.2	0.3097	0.4607	0.1427	0.0687	9.80	-175.18
4	4.2	0.3197	0.4607	0.1473	0.0687	10.11	-184.07
4	4.2	0.3297	0.4607	0.1519	0.0687	10.43	-192.95
4	4.2	0.3397	0.4607	0.1565	0.0687	10.75	-201.84
4	4.2	0.3497	0.4607	0.1611	0.0687	11.06	-210.72
4	4.2	0.3597	0.4607	0.1657	0.0687	11.38	-219.61
4	4.2	0.3697	0.4607	0.1703	0.0687	11.69	-228.49
4	4.2	0.3797	0.4607	0.1749	0.0687	12.01	-237.38
4	4.2	0.3897	0.4607	0.1795	0.0687	12.33	-246.27
4	4.2	0.3997	0.4607	0.1841	0.0687	12.64	-255.15

4	4.2	0.4097	0.4607	0.1887	0.0687	12.96	-264.04
4	4.2	0.4197	0.4607	0.1933	0.0687	13.28	-272.92
4	4.2	0.4297	0.4607	0.1979	0.0687	13.59	-281.81
4	4.2	0.4397	0.4607	0.2026	0.0687	13.91	-290.69
4	4.2	0.4497	0.4607	0.2072	0.0687	14.22	-299.58
4	4.2	0.4597	0.4607	0.2118	0.0687	14.54	-308.46
4	4.2	0.4697	0.4607	0.2164	0.0687	14.86	-317.35
4	4.2	0.4797	0.4607	0.2210	0.0687	15.17	-326.23
4	4.2	0.4897	0.4607	0.2256	0.0687	15.49	-335.12
4	4.2	0.4997	0.4607	0.2302	0.0687	15.81	-344.01
4	4.2	0.5097	0.4607	0.2348	0.0687	16.12	-352.89
4	4.2	0.5197	0.4607	0.2394	0.0687	16.44	-361.78
4	4.2	0.5297	0.4607	0.2440	0.0687	16.76	-370.66
4	4.2	0.5397	0.4607	0.2486	0.0687	17.07	-379.55
4	4.2	0.5497	0.4607	0.2532	0.0687	17.39	-388.43
4	4.2	0.5597	0.4607	0.2578	0.0687	17.70	-397.32
4	4.2	0.5697	0.4607	0.2624	0.0687	18.02	-406.20
4	4.2	0.5797	0.4607	0.2670	0.0687	18.34	-415.09
4	4.2	0.5897	0.4607	0.2717	0.0687	18.65	-423.97
4	4.2	0.5997	0.4607	0.2763	0.0687	18.97	-432.86
4	4.2	0.6097	0.4607	0.2809	0.0687	19.29	-441.75
4	4.2	0.6197	0.4607	0.2855	0.0687	19.60	-450.63

Table C5: Range of C_d for set 2 model (Type 25, Q_a = 2.98 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	3.95	0.0597	0.4607	0.0275	0.0662	1.82	38.94
4	3.95	0.0697	0.4607	0.0321	0.0662	2.12	28.71
4	3.95	0.0797	0.4607	0.0367	0.0662	2.43	18.48
4	3.95	0.0897	0.4607	0.0413	0.0662	2.73	8.25
4	3.95	0.0997	0.4607	0.0459	0.0662	**3.04**	**-1.98**
4	3.95	0.1097	0.4607	0.0505	0.0662	3.34	-12.21
4	3.95	0.1197	0.4607	0.0551	0.0662	3.65	-22.43
4	3.95	0.1297	0.4607	0.0597	0.0662	3.95	-32.66
4	3.95	0.1397	0.4607	0.0644	0.0662	4.26	-42.89
4	3.95	0.1497	0.4607	0.0690	0.0662	4.56	-53.12
4	3.95	0.1597	0.4607	0.0736	0.0662	4.87	-63.35
4	3.95	0.1697	0.4607	0.0782	0.0662	5.17	-73.58
4	3.95	0.1797	0.4607	0.0828	0.0662	5.48	-83.80
4	3.95	0.1897	0.4607	0.0874	0.0662	5.78	-94.03
4	3.95	0.1997	0.4607	0.0920	0.0662	6.09	-104.26
4	3.95	0.2097	0.4607	0.0966	0.0662	6.39	-114.49
4	3.95	0.2197	0.4607	0.1012	0.0662	6.70	-124.72
4	3.95	0.2297	0.4607	0.1058	0.0662	7.00	-134.95

4	3.95	0.2397	0.4607	0.1104	0.0662	7.31	-145.17
4	3.95	0.2497	0.4607	0.1150	0.0662	7.61	-155.40
4	3.95	0.2597	0.4607	0.1196	0.0662	7.92	-165.63
4	3.95	0.2697	0.4607	0.1242	0.0662	8.22	-175.86
4	3.95	0.2797	0.4607	0.1288	0.0662	8.53	-186.09
4	3.95	0.2897	0.4607	0.1335	0.0662	8.83	-196.32
4	3.95	0.2997	0.4607	0.1381	0.0662	9.14	-206.54
4	3.95	0.3097	0.4607	0.1427	0.0662	9.44	-216.77
4	3.95	0.3197	0.4607	0.1473	0.0662	9.74	-227.00
4	3.95	0.3297	0.4607	0.1519	0.0662	10.05	-237.23
4	3.95	0.3397	0.4607	0.1565	0.0662	10.35	-247.46
4	3.95	0.3497	0.4607	0.1611	0.0662	10.66	-257.69
4	3.95	0.3597	0.4607	0.1657	0.0662	10.96	-267.91
4	3.95	0.3697	0.4607	0.1703	0.0662	11.27	-278.14
4	3.95	0.3797	0.4607	0.1749	0.0662	11.57	-288.37
4	3.95	0.3897	0.4607	0.1795	0.0662	11.88	-298.60
4	3.95	0.3997	0.4607	0.1841	0.0662	12.18	-308.83
4	3.95	0.4097	0.4607	0.1887	0.0662	12.49	-319.06
4	3.95	0.4197	0.4607	0.1933	0.0662	12.79	-329.28
4	3.95	0.4297	0.4607	0.1979	0.0662	13.10	-339.51
4	3.95	0.4397	0.4607	0.2026	0.0662	13.40	-349.74
4	3.95	0.4497	0.4607	0.2072	0.0662	13.71	-359.97
4	3.95	0.4597	0.4607	0.2118	0.0662	14.01	-370.20
4	3.95	0.4697	0.4607	0.2164	0.0662	14.32	-380.43
4	3.95	0.4797	0.4607	0.2210	0.0662	14.62	-390.65
4	3.95	0.4897	0.4607	0.2256	0.0662	14.93	-400.88
4	3.95	0.4997	0.4607	0.2302	0.0662	15.23	-411.11
4	3.95	0.5097	0.4607	0.2348	0.0662	15.54	-421.34
4	3.95	0.5197	0.4607	0.2394	0.0662	15.84	-431.57
4	3.95	0.5297	0.4607	0.2440	0.0662	16.15	-441.80
4	3.95	0.5397	0.4607	0.2486	0.0662	16.45	-452.02
4	3.95	0.5497	0.4607	0.2532	0.0662	16.76	-462.25
4	3.95	0.5597	0.4607	0.2578	0.0662	17.06	-472.48
4	3.95	0.5697	0.4607	0.2624	0.0662	17.36	-482.71
4	3.95	0.5797	0.4607	0.2670	0.0662	17.67	-492.94
4	3.95	0.5897	0.4607	0.2717	0.0662	17.97	-503.17
4	3.95	0.5997	0.4607	0.2763	0.0662	18.28	-513.39
4	3.95	0.6097	0.4607	0.2809	0.0662	18.58	-523.62
4	3.95	0.6197	0.4607	0.2855	0.0662	18.89	-533.85

Table C6: Range of C_d for set 2 model (Type 31, Q_a = 6.24 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	5.54	0.0597	0.4607	0.0275	0.0821	2.26	63.83
4	5.54	0.0697	0.4607	0.0321	0.0821	2.64	57.77
4	5.54	0.0797	0.4607	0.0367	0.0821	3.01	51.71
4	5.54	0.0897	0.4607	0.0413	0.0821	3.39	45.66
4	5.54	0.0997	0.4607	0.0459	0.0821	3.77	39.60
4	5.54	0.1097	0.4607	0.0505	0.0821	4.15	33.54
4	5.54	0.1197	0.4607	0.0551	0.0821	4.53	27.48
4	5.54	0.1297	0.4607	0.0597	0.0821	4.90	21.42
4	5.54	0.1397	0.4607	0.0644	0.0821	5.28	15.36
4	5.54	0.1497	0.4607	0.0690	0.0821	5.66	9.30
4	5.54	0.1597	0.4607	0.0736	0.0821	**6.04**	**3.25**
4	5.54	0.1697	0.4607	0.0782	0.0821	6.42	-2.81
4	5.54	0.1797	0.4607	0.0828	0.0821	6.79	-8.87
4	5.54	0.1897	0.4607	0.0874	0.0821	7.17	-14.93
4	5.54	0.1997	0.4607	0.0920	0.0821	7.55	-20.99
4	5.54	0.2097	0.4607	0.0966	0.0821	7.93	-27.05
4	5.54	0.2197	0.4607	0.1012	0.0821	8.31	-33.11
4	5.54	0.2297	0.4607	0.1058	0.0821	8.68	-39.16
4	5.54	0.2397	0.4607	0.1104	0.0821	9.06	-45.22
4	5.54	0.2497	0.4607	0.1150	0.0821	9.44	-51.28
4	5.54	0.2597	0.4607	0.1196	0.0821	9.82	-57.34
4	5.54	0.2697	0.4607	0.1242	0.0821	10.20	-63.40
4	5.54	0.2797	0.4607	0.1288	0.0821	10.57	-69.46
4	5.54	0.2897	0.4607	0.1335	0.0821	10.95	-75.51
4	5.54	0.2997	0.4607	0.1381	0.0821	11.33	-81.57
4	5.54	0.3097	0.4607	0.1427	0.0821	11.71	-87.63
4	5.54	0.3197	0.4607	0.1473	0.0821	12.09	-93.69
4	5.54	0.3297	0.4607	0.1519	0.0821	12.46	-99.75
4	5.54	0.3397	0.4607	0.1565	0.0821	12.84	-105.81
4	5.54	0.3497	0.4607	0.1611	0.0821	13.22	-111.87
4	5.54	0.3597	0.4607	0.1657	0.0821	13.60	-117.92
4	5.54	0.3697	0.4607	0.1703	0.0821	13.98	-123.98
4	5.54	0.3797	0.4607	0.1749	0.0821	14.35	-130.04
4	5.54	0.3897	0.4607	0.1795	0.0821	14.73	-136.10
4	5.54	0.3997	0.4607	0.1841	0.0821	15.11	-142.16
4	5.54	0.4097	0.4607	0.1887	0.0821	15.49	-148.22
4	5.54	0.4197	0.4607	0.1933	0.0821	15.87	-154.28
4	5.54	0.4297	0.4607	0.1979	0.0821	16.24	-160.33
4	5.54	0.4397	0.4607	0.2026	0.0821	16.62	-166.39
4	5.54	0.4497	0.4607	0.2072	0.0821	17.00	-172.45
4	5.54	0.4597	0.4607	0.2118	0.0821	17.38	-178.51
4	5.54	0.4697	0.4607	0.2164	0.0821	17.76	-184.57
4	5.54	0.4797	0.4607	0.2210	0.0821	18.14	-190.63

4	5.54	0.4897	0.4607	0.2256	0.0821	18.51	-196.68
4	5.54	0.4997	0.4607	0.2302	0.0821	18.89	-202.74
4	5.54	0.5097	0.4607	0.2348	0.0821	19.27	-208.80
4	5.54	0.5197	0.4607	0.2394	0.0821	19.65	-214.86
4	5.54	0.5297	0.4607	0.2440	0.0821	20.03	-220.92
4	5.54	0.5397	0.4607	0.2486	0.0821	20.40	-226.98
4	5.54	0.5497	0.4607	0.2532	0.0821	20.78	-233.04
4	5.54	0.5597	0.4607	0.2578	0.0821	21.16	-239.09
4	5.54	0.5697	0.4607	0.2624	0.0821	21.54	-245.15
4	5.54	0.5797	0.4607	0.2670	0.0821	21.92	-251.21
4	5.54	0.5897	0.4607	0.2717	0.0821	22.29	-257.27
4	5.54	0.5997	0.4607	0.2763	0.0821	22.67	-263.33
4	5.54	0.6097	0.4607	0.2809	0.0821	23.05	-269.39
4	5.54	0.6197	0.4607	0.2855	0.0821	23.43	-275.45

Table C7: Range of C_d for set 2 model (Type 32, Q_a = 5.34 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	5.54	0.0597	0.4607	0.0275	0.0821	2.26	63.83
4	5.54	0.0697	0.4607	0.0321	0.0821	2.64	57.77
4	5.54	0.0797	0.4607	0.0367	0.0821	3.01	51.71
4	5.54	0.0897	0.4607	0.0413	0.0821	3.39	45.66
4	5.54	0.0997	0.4607	0.0459	0.0821	3.77	39.60
4	5.54	0.1097	0.4607	0.0505	0.0821	4.15	33.54
4	5.54	0.1197	0.4607	0.0551	0.0821	4.53	27.48
4	5.54	0.1297	0.4607	0.0597	0.0821	4.90	21.42
4	5.54	0.1397	0.4607	0.0644	0.0821	5.28	15.36
4	5.54	0.1497	0.4607	0.0690	0.0821	5.66	9.30
4	5.54	0.1597	0.4607	0.0736	0.0821	**6.04**	**3.25**
4	5.54	0.1697	0.4607	0.0782	0.0821	6.42	-2.81
4	5.54	0.1797	0.4607	0.0828	0.0821	6.79	-8.87
4	5.54	0.1897	0.4607	0.0874	0.0821	7.17	-14.93
4	5.54	0.1997	0.4607	0.0920	0.0821	7.55	-20.99
4	5.54	0.2097	0.4607	0.0966	0.0821	7.93	-27.05
4	5.54	0.2197	0.4607	0.1012	0.0821	8.31	-33.11
4	5.54	0.2297	0.4607	0.1058	0.0821	8.68	-39.16
4	5.54	0.2397	0.4607	0.1104	0.0821	9.06	-45.22
4	5.54	0.2497	0.4607	0.1150	0.0821	9.44	-51.28
4	5.54	0.2597	0.4607	0.1196	0.0821	9.82	-57.34
4	5.54	0.2697	0.4607	0.1242	0.0821	10.20	-63.40
4	5.54	0.2797	0.4607	0.1288	0.0821	10.57	-69.46
4	5.54	0.2897	0.4607	0.1335	0.0821	10.95	-75.51
4	5.54	0.2997	0.4607	0.1381	0.0821	11.33	-81.57
4	5.54	0.3097	0.4607	0.1427	0.0821	11.71	-87.63

4	5.54	0.3197	0.4607	0.1473	0.0821	12.09	-93.69
4	5.54	0.3297	0.4607	0.1519	0.0821	12.46	-99.75
4	5.54	0.3397	0.4607	0.1565	0.0821	12.84	-105.81
4	5.54	0.3497	0.4607	0.1611	0.0821	13.22	-111.87
4	5.54	0.3597	0.4607	0.1657	0.0821	13.60	-117.92
4	5.54	0.3697	0.4607	0.1703	0.0821	13.98	-123.98
4	5.54	0.3797	0.4607	0.1749	0.0821	14.35	-130.04
4	5.54	0.3897	0.4607	0.1795	0.0821	14.73	-136.10
4	5.54	0.3997	0.4607	0.1841	0.0821	15.11	-142.16
4	5.54	0.4097	0.4607	0.1887	0.0821	15.49	-148.22
4	5.54	0.4197	0.4607	0.1933	0.0821	15.87	-154.28
4	5.54	0.4297	0.4607	0.1979	0.0821	16.24	-160.33
4	5.54	0.4397	0.4607	0.2026	0.0821	16.62	-166.39
4	5.54	0.4497	0.4607	0.2072	0.0821	17.00	-172.45
4	5.54	0.4597	0.4607	0.2118	0.0821	17.38	-178.51
4	5.54	0.4697	0.4607	0.2164	0.0821	17.76	-184.57
4	5.54	0.4797	0.4607	0.2210	0.0821	18.14	-190.63
4	5.54	0.4897	0.4607	0.2256	0.0821	18.51	-196.68
4	5.54	0.4997	0.4607	0.2302	0.0821	18.89	-202.74
4	5.54	0.5097	0.4607	0.2348	0.0821	19.27	-208.80
4	5.54	0.5197	0.4607	0.2394	0.0821	19.65	-214.86
4	5.54	0.5297	0.4607	0.2440	0.0821	20.03	-220.92
4	5.54	0.5397	0.4607	0.2486	0.0821	20.40	-226.98
4	5.54	0.5497	0.4607	0.2532	0.0821	20.78	-233.04
4	5.54	0.5597	0.4607	0.2578	0.0821	21.16	-239.09
4	5.54	0.5697	0.4607	0.2624	0.0821	21.54	-245.15
4	5.54	0.5797	0.4607	0.2670	0.0821	21.92	-251.21
4	5.54	0.5897	0.4607	0.2717	0.0821	22.29	-257.27
4	5.54	0.5997	0.4607	0.2763	0.0821	22.67	-263.33
4	5.54	0.6097	0.4607	0.2809	0.0821	23.05	-269.39
4	5.54	0.6197	0.4607	0.2855	0.0821	23.43	-275.45

Table C8: Range of C_d for set 2 model (Type 33, Q_a = 4.40 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	4.78	0.0597	0.4607	0.0275	0.0745	2.05	53.46
4	4.78	0.0697	0.4607	0.0321	0.0745	2.39	45.66
4	4.78	0.0797	0.4607	0.0367	0.0745	2.73	37.86
4	4.78	0.0897	0.4607	0.0413	0.0745	3.08	30.07
4	4.78	0.0997	0.4607	0.0459	0.0745	3.42	22.27
4	4.78	0.1097	0.4607	0.0505	0.0745	3.76	14.47
4	4.78	0.1197	0.4607	0.0551	0.0745	4.11	6.68
4	4.78	0.1297	0.4607	0.0597	0.0745	**4.45**	**-1.12**
4	4.78	0.1397	0.4607	0.0644	0.0745	4.79	-8.92

4	4.78	0.1497	0.4607	0.0690	0.0745	5.14	-16.71
4	4.78	0.1597	0.4607	0.0736	0.0745	5.48	-24.51
4	4.78	0.1697	0.4607	0.0782	0.0745	5.82	-32.30
4	4.78	0.1797	0.4607	0.0828	0.0745	6.16	-40.10
4	4.78	0.1897	0.4607	0.0874	0.0745	6.51	-47.90
4	4.78	0.1997	0.4607	0.0920	0.0745	6.85	-55.69
4	4.78	0.2097	0.4607	0.0966	0.0745	7.19	-63.49
4	4.78	0.2197	0.4607	0.1012	0.0745	7.54	-71.29
4	4.78	0.2297	0.4607	0.1058	0.0745	7.88	-79.08
4	4.78	0.2397	0.4607	0.1104	0.0745	8.22	-86.88
4	4.78	0.2497	0.4607	0.1150	0.0745	8.57	-94.68
4	4.78	0.2597	0.4607	0.1196	0.0745	8.91	-102.47
4	4.78	0.2697	0.4607	0.1242	0.0745	9.25	-110.27
4	4.78	0.2797	0.4607	0.1288	0.0745	9.59	-118.06
4	4.78	0.2897	0.4607	0.1335	0.0745	9.94	-125.86
4	4.78	0.2997	0.4607	0.1381	0.0745	10.28	-133.66
4	4.78	0.3097	0.4607	0.1427	0.0745	10.62	-141.45
4	4.78	0.3197	0.4607	0.1473	0.0745	10.97	-149.25
4	4.78	0.3297	0.4607	0.1519	0.0745	11.31	-157.05
4	4.78	0.3397	0.4607	0.1565	0.0745	11.65	-164.84
4	4.78	0.3497	0.4607	0.1611	0.0745	12.00	-172.64
4	4.78	0.3597	0.4607	0.1657	0.0745	12.34	-180.44
4	4.78	0.3697	0.4607	0.1703	0.0745	12.68	-188.23
4	4.78	0.3797	0.4607	0.1749	0.0745	13.03	-196.03
4	4.78	0.3897	0.4607	0.1795	0.0745	13.37	-203.82
4	4.78	0.3997	0.4607	0.1841	0.0745	13.71	-211.62
4	4.78	0.4097	0.4607	0.1887	0.0745	14.05	-219.42
4	4.78	0.4197	0.4607	0.1933	0.0745	14.40	-227.21
4	4.78	0.4297	0.4607	0.1979	0.0745	14.74	-235.01
4	4.78	0.4397	0.4607	0.2026	0.0745	15.08	-242.81
4	4.78	0.4497	0.4607	0.2072	0.0745	15.43	-250.60
4	4.78	0.4597	0.4607	0.2118	0.0745	15.77	-258.40
4	4.78	0.4697	0.4607	0.2164	0.0745	16.11	-266.20
4	4.78	0.4797	0.4607	0.2210	0.0745	16.46	-273.99
4	4.78	0.4897	0.4607	0.2256	0.0745	16.80	-281.79
4	4.78	0.4997	0.4607	0.2302	0.0745	17.14	-289.58
4	4.78	0.5097	0.4607	0.2348	0.0745	17.48	-297.38
4	4.78	0.5197	0.4607	0.2394	0.0745	17.83	-305.18
4	4.78	0.5297	0.4607	0.2440	0.0745	18.17	-312.97
4	4.78	0.5397	0.4607	0.2486	0.0745	18.51	-320.77
4	4.78	0.5497	0.4607	0.2532	0.0745	18.86	-328.57
4	4.78	0.5597	0.4607	0.2578	0.0745	19.20	-336.36
4	4.78	0.5697	0.4607	0.2624	0.0745	19.54	-344.16
4	4.78	0.5797	0.4607	0.2670	0.0745	19.89	-351.96
4	4.78	0.5897	0.4607	0.2717	0.0745	20.23	-359.75
4	4.78	0.5997	0.4607	0.2763	0.0745	20.57	-367.55

4	4.78	0.6097	0.4607	0.2809	0.0745	20.92	-375.34
4	4.78	0.6197	0.4607	0.2855	0.0745	21.26	-383.14

Table C9: Range of C_d for set 2 model (Type 34, Q_a = 3.56 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	4.5	0.0597	0.4607	0.0275	0.0717	1.97	44.64
4	4.5	0.0697	0.4607	0.0321	0.0717	2.30	35.36
4	4.5	0.0797	0.4607	0.0367	0.0717	2.63	26.09
4	4.5	0.0897	0.4607	0.0413	0.0717	2.96	16.82
4	4.5	0.0997	0.4607	0.0459	0.0717	3.29	7.54
4	4.5	0.1097	0.4607	0.0505	0.0717	**3.62**	**-1.73**
4	4.5	0.1197	0.4607	0.0551	0.0717	3.95	-11.01
4	4.5	0.1297	0.4607	0.0597	0.0717	4.28	-20.28
4	4.5	0.1397	0.4607	0.0644	0.0717	4.61	-29.55
4	4.5	0.1497	0.4607	0.0690	0.0717	4.94	-38.83
4	4.5	0.1597	0.4607	0.0736	0.0717	5.27	-48.10
4	4.5	0.1697	0.4607	0.0782	0.0717	5.60	-57.37
4	4.5	0.1797	0.4607	0.0828	0.0717	5.93	-66.65
4	4.5	0.1897	0.4607	0.0874	0.0717	6.26	-75.92
4	4.5	0.1997	0.4607	0.0920	0.0717	6.59	-85.19
4	4.5	0.2097	0.4607	0.0966	0.0717	6.92	-94.47
4	4.5	0.2197	0.4607	0.1012	0.0717	7.25	-103.74
4	4.5	0.2297	0.4607	0.1058	0.0717	7.58	-113.02
4	4.5	0.2397	0.4607	0.1104	0.0717	7.91	-122.29
4	4.5	0.2497	0.4607	0.1150	0.0717	8.24	-131.56
4	4.5	0.2597	0.4607	0.1196	0.0717	8.57	-140.84
4	4.5	0.2697	0.4607	0.1242	0.0717	8.90	-150.11
4	4.5	0.2797	0.4607	0.1288	0.0717	9.23	-159.38
4	4.5	0.2897	0.4607	0.1335	0.0717	9.56	-168.66
4	4.5	0.2997	0.4607	0.1381	0.0717	9.89	-177.93
4	4.5	0.3097	0.4607	0.1427	0.0717	10.22	-187.20
4	4.5	0.3197	0.4607	0.1473	0.0717	10.55	-196.48
4	4.5	0.3297	0.4607	0.1519	0.0717	10.88	-205.75
4	4.5	0.3397	0.4607	0.1565	0.0717	11.21	-215.03
4	4.5	0.3497	0.4607	0.1611	0.0717	11.55	-224.30
4	4.5	0.3597	0.4607	0.1657	0.0717	11.88	-233.57
4	4.5	0.3697	0.4607	0.1703	0.0717	12.21	-242.85
4	4.5	0.3797	0.4607	0.1749	0.0717	12.54	-252.12
4	4.5	0.3897	0.4607	0.1795	0.0717	12.87	-261.39
4	4.5	0.3997	0.4607	0.1841	0.0717	13.20	-270.67
4	4.5	0.4097	0.4607	0.1887	0.0717	13.53	-279.94
4	4.5	0.4197	0.4607	0.1933	0.0717	13.86	-289.21
4	4.5	0.4297	0.4607	0.1979	0.0717	14.19	-298.49

4	4.5	0.4397	0.4607	0.2026	0.0717	14.52	-307.76
4	4.5	0.4497	0.4607	0.2072	0.0717	14.85	-317.04
4	4.5	0.4597	0.4607	0.2118	0.0717	15.18	-326.31
4	4.5	0.4697	0.4607	0.2164	0.0717	15.51	-335.58
4	4.5	0.4797	0.4607	0.2210	0.0717	15.84	-344.86
4	4.5	0.4897	0.4607	0.2256	0.0717	16.17	-354.13
4	4.5	0.4997	0.4607	0.2302	0.0717	16.50	-363.40
4	4.5	0.5097	0.4607	0.2348	0.0717	16.83	-372.68
4	4.5	0.5197	0.4607	0.2394	0.0717	17.16	-381.95
4	4.5	0.5297	0.4607	0.2440	0.0717	17.49	-391.22
4	4.5	0.5397	0.4607	0.2486	0.0717	17.82	-400.50
4	4.5	0.5497	0.4607	0.2532	0.0717	18.15	-409.77
4	4.5	0.5597	0.4607	0.2578	0.0717	18.48	-419.05
4	4.5	0.5697	0.4607	0.2624	0.0717	18.81	-428.32
4	4.5	0.5797	0.4607	0.2670	0.0717	19.14	-437.59
4	4.5	0.5897	0.4607	0.2717	0.0717	19.47	-446.87
4	4.5	0.5997	0.4607	0.2763	0.0717	19.80	-456.14
4	4.5	0.6097	0.4607	0.2809	0.0717	20.13	-465.41
4	4.5	0.6197	0.4607	0.2855	0.0717	20.46	-474.69

Table C10: Range of C_d for set 2 model (Type 35, Q_a = 2.98 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	4.2	0.0597	0.4607	0.0275	0.0687	1.89	36.63
4	4.2	0.0697	0.4607	0.0321	0.0687	2.20	26.01
4	4.2	0.0797	0.4607	0.0367	0.0687	2.52	15.40
4	4.2	0.0897	0.4607	0.0413	0.0687	**2.84**	**4.79**
4	4.2	0.0997	0.4607	0.0459	0.0687	3.15	-5.83
4	4.2	0.1097	0.4607	0.0505	0.0687	3.47	-16.44
4	4.2	0.1197	0.4607	0.0551	0.0687	3.79	-27.06
4	4.2	0.1297	0.4607	0.0597	0.0687	4.10	-37.67
4	4.2	0.1397	0.4607	0.0644	0.0687	4.42	-48.29
4	4.2	0.1497	0.4607	0.0690	0.0687	4.74	-58.90
4	4.2	0.1597	0.4607	0.0736	0.0687	5.05	-69.52
4	4.2	0.1697	0.4607	0.0782	0.0687	5.37	-80.13
4	4.2	0.1797	0.4607	0.0828	0.0687	5.68	-90.75
4	4.2	0.1897	0.4607	0.0874	0.0687	6.00	-101.36
4	4.2	0.1997	0.4607	0.0920	0.0687	6.32	-111.98
4	4.2	0.2097	0.4607	0.0966	0.0687	6.63	-122.59
4	4.2	0.2197	0.4607	0.1012	0.0687	6.95	-133.21
4	4.2	0.2297	0.4607	0.1058	0.0687	7.27	-143.82
4	4.2	0.2397	0.4607	0.1104	0.0687	7.58	-154.44
4	4.2	0.2497	0.4607	0.1150	0.0687	7.90	-165.05
4	4.2	0.2597	0.4607	0.1196	0.0687	8.21	-175.67

4	4.2	0.2697	0.4607	0.1242	0.0687	8.53	-186.28
4	4.2	0.2797	0.4607	0.1288	0.0687	8.85	-196.90
4	4.2	0.2897	0.4607	0.1335	0.0687	9.16	-207.51
4	4.2	0.2997	0.4607	0.1381	0.0687	9.48	-218.13
4	4.2	0.3097	0.4607	0.1427	0.0687	9.80	-228.74
4	4.2	0.3197	0.4607	0.1473	0.0687	10.11	-239.36
4	4.2	0.3297	0.4607	0.1519	0.0687	10.43	-249.97
4	4.2	0.3397	0.4607	0.1565	0.0687	10.75	-260.59
4	4.2	0.3497	0.4607	0.1611	0.0687	11.06	-271.20
4	4.2	0.3597	0.4607	0.1657	0.0687	11.38	-281.81
4	4.2	0.3697	0.4607	0.1703	0.0687	11.69	-292.43
4	4.2	0.3797	0.4607	0.1749	0.0687	12.01	-303.04
4	4.2	0.3897	0.4607	0.1795	0.0687	12.33	-313.66
4	4.2	0.3997	0.4607	0.1841	0.0687	12.64	-324.27
4	4.2	0.4097	0.4607	0.1887	0.0687	12.96	-334.89
4	4.2	0.4197	0.4607	0.1933	0.0687	13.28	-345.50
4	4.2	0.4297	0.4607	0.1979	0.0687	13.59	-356.12
4	4.2	0.4397	0.4607	0.2026	0.0687	13.91	-366.73
4	4.2	0.4497	0.4607	0.2072	0.0687	14.22	-377.35
4	4.2	0.4597	0.4607	0.2118	0.0687	14.54	-387.96
4	4.2	0.4697	0.4607	0.2164	0.0687	14.86	-398.58
4	4.2	0.4797	0.4607	0.2210	0.0687	15.17	-409.19
4	4.2	0.4897	0.4607	0.2256	0.0687	15.49	-419.81
4	4.2	0.4997	0.4607	0.2302	0.0687	15.81	-430.42
4	4.2	0.5097	0.4607	0.2348	0.0687	16.12	-441.04
4	4.2	0.5197	0.4607	0.2394	0.0687	16.44	-451.65
4	4.2	0.5297	0.4607	0.2440	0.0687	16.76	-462.27
4	4.2	0.5397	0.4607	0.2486	0.0687	17.07	-472.88
4	4.2	0.5497	0.4607	0.2532	0.0687	17.39	-483.50
4	4.2	0.5597	0.4607	0.2578	0.0687	17.70	-494.11
4	4.2	0.5697	0.4607	0.2624	0.0687	18.02	-504.73
4	4.2	0.5797	0.4607	0.2670	0.0687	18.34	-515.34
4	4.2	0.5897	0.4607	0.2717	0.0687	18.65	-525.96
4	4.2	0.5997	0.4607	0.2763	0.0687	18.97	-536.57
4	4.2	0.6097	0.4607	0.2809	0.0687	19.29	-547.19
4	4.2	0.6197	0.4607	0.2855	0.0687	19.60	-557.80

Table C11: Range of C_d for set 2 model (Type 41, Q_a = 6.24 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	5.56	0.0597	0.4607	0.0275	0.0823	2.26	63.74
4	5.56	0.0697	0.4607	0.0321	0.0823	2.64	57.67
4	5.56	0.0797	0.4607	0.0367	0.0823	3.02	51.60
4	5.56	0.0897	0.4607	0.0413	0.0823	3.40	45.52
4	5.56	0.0997	0.4607	0.0459	0.0823	3.78	39.45
4	5.56	0.1097	0.4607	0.0505	0.0823	4.16	33.38
4	5.56	0.1197	0.4607	0.0551	0.0823	4.54	27.30
4	5.56	0.1297	0.4607	0.0597	0.0823	4.92	21.23
4	5.56	0.1397	0.4607	0.0644	0.0823	5.29	15.16
4	5.56	0.1497	0.4607	0.0690	0.0823	5.67	9.08
4	5.56	0.1597	0.4607	0.0736	0.0823	**6.05**	**3.01**
4	5.56	0.1697	0.4607	0.0782	0.0823	6.43	-3.06
4	5.56	0.1797	0.4607	0.0828	0.0823	6.81	-9.14
4	5.56	0.1897	0.4607	0.0874	0.0823	7.19	-15.21
4	5.56	0.1997	0.4607	0.0920	0.0823	7.57	-21.28
4	5.56	0.2097	0.4607	0.0966	0.0823	7.95	-27.36
4	5.56	0.2197	0.4607	0.1012	0.0823	8.33	-33.43
4	5.56	0.2297	0.4607	0.1058	0.0823	8.70	-39.50
4	5.56	0.2397	0.4607	0.1104	0.0823	9.08	-45.58
4	5.56	0.2497	0.4607	0.1150	0.0823	9.46	-51.65
4	5.56	0.2597	0.4607	0.1196	0.0823	9.84	-57.72
4	5.56	0.2697	0.4607	0.1242	0.0823	10.22	-63.80
4	5.56	0.2797	0.4607	0.1288	0.0823	10.60	-69.87
4	5.56	0.2897	0.4607	0.1335	0.0823	10.98	-75.94
4	5.56	0.2997	0.4607	0.1381	0.0823	11.36	-82.02
4	5.56	0.3097	0.4607	0.1427	0.0823	11.74	-88.09
4	5.56	0.3197	0.4607	0.1473	0.0823	12.12	-94.16
4	5.56	0.3297	0.4607	0.1519	0.0823	12.49	-100.24
4	5.56	0.3397	0.4607	0.1565	0.0823	12.87	-106.31
4	5.56	0.3497	0.4607	0.1611	0.0823	13.25	-112.38
4	5.56	0.3597	0.4607	0.1657	0.0823	13.63	-118.46
4	5.56	0.3697	0.4607	0.1703	0.0823	14.01	-124.53
4	5.56	0.3797	0.4607	0.1749	0.0823	14.39	-130.60
4	5.56	0.3897	0.4607	0.1795	0.0823	14.77	-136.68
4	5.56	0.3997	0.4607	0.1841	0.0823	15.15	-142.75
4	5.56	0.4097	0.4607	0.1887	0.0823	15.53	-148.82
4	5.56	0.4197	0.4607	0.1933	0.0823	15.91	-154.89
4	5.56	0.4297	0.4607	0.1979	0.0823	16.28	-160.97
4	5.56	0.4397	0.4607	0.2026	0.0823	16.66	-167.04
4	5.56	0.4497	0.4607	0.2072	0.0823	17.04	-173.11
4	5.56	0.4597	0.4607	0.2118	0.0823	17.42	-179.19
4	5.56	0.4697	0.4607	0.2164	0.0823	17.80	-185.26
4	5.56	0.4797	0.4607	0.2210	0.0823	18.18	-191.33

4	5.56	0.4897	0.4607	0.2256	0.0823	18.56	-197.41
4	5.56	0.4997	0.4607	0.2302	0.0823	18.94	-203.48
4	5.56	0.5097	0.4607	0.2348	0.0823	19.32	-209.55
4	5.56	0.5197	0.4607	0.2394	0.0823	19.70	-215.63
4	5.56	0.5297	0.4607	0.2440	0.0823	20.07	-221.70
4	5.56	0.5397	0.4607	0.2486	0.0823	20.45	-227.77
4	5.56	0.5497	0.4607	0.2532	0.0823	20.83	-233.85
4	5.56	0.5597	0.4607	0.2578	0.0823	21.21	-239.92
4	5.56	0.5697	0.4607	0.2624	0.0823	21.59	-245.99
4	5.56	0.5797	0.4607	0.2670	0.0823	21.97	-252.07
4	5.56	0.5897	0.4607	0.2717	0.0823	22.35	-258.14
4	5.56	0.5997	0.4607	0.2763	0.0823	22.73	-264.21
4	5.56	0.6097	0.4607	0.2809	0.0823	23.11	-270.29
4	5.56	0.6197	0.4607	0.2855	0.0823	23.48	-276.36

Table C12: Range of C_d for set 2 model (Type 42, Q_a = 5.34 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	5.23	0.0597	0.4607	0.0275	0.0790	2.17	59.33
4	5.23	0.0697	0.4607	0.0321	0.0790	2.54	52.52
4	5.23	0.0797	0.4607	0.0367	0.0790	2.90	45.71
4	5.23	0.0897	0.4607	0.0413	0.0790	3.26	38.89
4	5.23	0.0997	0.4607	0.0459	0.0790	3.63	32.08
4	5.23	0.1097	0.4607	0.0505	0.0790	3.99	25.27
4	5.23	0.1197	0.4607	0.0551	0.0790	4.35	18.46
4	5.23	0.1297	0.4607	0.0597	0.0790	4.72	11.65
4	5.23	0.1397	0.4607	0.0644	0.0790	5.08	4.83
4	5.23	0.1497	0.4607	0.0690	0.0790	**5.45**	**-1.98**
4	5.23	0.1597	0.4607	0.0736	0.0790	5.81	-8.79
4	5.23	0.1697	0.4607	0.0782	0.0790	6.17	-15.60
4	5.23	0.1797	0.4607	0.0828	0.0790	6.54	-22.41
4	5.23	0.1897	0.4607	0.0874	0.0790	6.90	-29.23
4	5.23	0.1997	0.4607	0.0920	0.0790	7.26	-36.04
4	5.23	0.2097	0.4607	0.0966	0.0790	7.63	-42.85
4	5.23	0.2197	0.4607	0.1012	0.0790	7.99	-49.66
4	5.23	0.2297	0.4607	0.1058	0.0790	8.36	-56.48
4	5.23	0.2397	0.4607	0.1104	0.0790	8.72	-63.29
4	5.23	0.2497	0.4607	0.1150	0.0790	9.08	-70.10
4	5.23	0.2597	0.4607	0.1196	0.0790	9.45	-76.91
4	5.23	0.2697	0.4607	0.1242	0.0790	9.81	-83.72
4	5.23	0.2797	0.4607	0.1288	0.0790	10.17	-90.54
4	5.23	0.2897	0.4607	0.1335	0.0790	10.54	-97.35
4	5.23	0.2997	0.4607	0.1381	0.0790	10.90	-104.16
4	5.23	0.3097	0.4607	0.1427	0.0790	11.27	-110.97

4	5.23	0.3197	0.4607	0.1473	0.0790	11.63	-117.79
4	5.23	0.3297	0.4607	0.1519	0.0790	11.99	-124.60
4	5.23	0.3397	0.4607	0.1565	0.0790	12.36	-131.41
4	5.23	0.3497	0.4607	0.1611	0.0790	12.72	-138.22
4	5.23	0.3597	0.4607	0.1657	0.0790	13.08	-145.03
4	5.23	0.3697	0.4607	0.1703	0.0790	13.45	-151.85
4	5.23	0.3797	0.4607	0.1749	0.0790	13.81	-158.66
4	5.23	0.3897	0.4607	0.1795	0.0790	14.18	-165.47
4	5.23	0.3997	0.4607	0.1841	0.0790	14.54	-172.28
4	5.23	0.4097	0.4607	0.1887	0.0790	14.90	-179.09
4	5.23	0.4197	0.4607	0.1933	0.0790	15.27	-185.91
4	5.23	0.4297	0.4607	0.1979	0.0790	15.63	-192.72
4	5.23	0.4397	0.4607	0.2026	0.0790	15.99	-199.53
4	5.23	0.4497	0.4607	0.2072	0.0790	16.36	-206.34
4	5.23	0.4597	0.4607	0.2118	0.0790	16.72	-213.16
4	5.23	0.4697	0.4607	0.2164	0.0790	17.09	-219.97
4	5.23	0.4797	0.4607	0.2210	0.0790	17.45	-226.78
4	5.23	0.4897	0.4607	0.2256	0.0790	17.81	-233.59
4	5.23	0.4997	0.4607	0.2302	0.0790	18.18	-240.40
4	5.23	0.5097	0.4607	0.2348	0.0790	18.54	-247.22
4	5.23	0.5197	0.4607	0.2394	0.0790	18.91	-254.03
4	5.23	0.5297	0.4607	0.2440	0.0790	19.27	-260.84
4	5.23	0.5397	0.4607	0.2486	0.0790	19.63	-267.65
4	5.23	0.5497	0.4607	0.2532	0.0790	20.00	-274.46
4	5.23	0.5597	0.4607	0.2578	0.0790	20.36	-281.28
4	5.23	0.5697	0.4607	0.2624	0.0790	20.72	-288.09
4	5.23	0.5797	0.4607	0.2670	0.0790	21.09	-294.90
4	5.23	0.5897	0.4607	0.2717	0.0790	21.45	-301.71
4	5.23	0.5997	0.4607	0.2763	0.0790	21.82	-308.53
4	5.23	0.6097	0.4607	0.2809	0.0790	22.18	-315.34
4	5.23	0.6197	0.4607	0.2855	0.0790	22.54	-322.15

Table C13: Range of C_d for set 2 model (Type 43, Q_a = 4.40 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	4.94	0.0597	0.4607	0.0275	0.0761	2.09	52.46
4	4.94	0.0697	0.4607	0.0321	0.0761	2.44	44.49
4	4.94	0.0797	0.4607	0.0367	0.0761	2.79	36.53
4	4.94	0.0897	0.4607	0.0413	0.0761	3.14	28.56
4	4.94	0.0997	0.4607	0.0459	0.0761	3.49	20.60
4	4.94	0.1097	0.4607	0.0505	0.0761	3.84	12.64
4	4.94	0.1197	0.4607	0.0551	0.0761	4.19	4.67
4	4.94	0.1297	0.4607	0.0597	0.0761	**4.54**	**-3.29**
4	4.94	0.1397	0.4607	0.0644	0.0761	4.90	-11.26
4	4.94	0.1497	0.4607	0.0690	0.0761	5.25	-19.22
4	4.94	0.1597	0.4607	0.0736	0.0761	5.60	-27.18
4	4.94	0.1697	0.4607	0.0782	0.0761	5.95	-35.15
4	4.94	0.1797	0.4607	0.0828	0.0761	6.30	-43.11
4	4.94	0.1897	0.4607	0.0874	0.0761	6.65	-51.07
4	4.94	0.1997	0.4607	0.0920	0.0761	7.00	-59.04
4	4.94	0.2097	0.4607	0.0966	0.0761	7.35	-67.00
4	4.94	0.2197	0.4607	0.1012	0.0761	7.70	-74.97
4	4.94	0.2297	0.4607	0.1058	0.0761	8.05	-82.93
4	4.94	0.2397	0.4607	0.1104	0.0761	8.40	-90.89
4	4.94	0.2497	0.4607	0.1150	0.0761	8.75	-98.86
4	4.94	0.2597	0.4607	0.1196	0.0761	9.10	-106.82
4	4.94	0.2697	0.4607	0.1242	0.0761	9.45	-114.79
4	4.94	0.2797	0.4607	0.1288	0.0761	9.80	-122.75
4	4.94	0.2897	0.4607	0.1335	0.0761	10.15	-130.71
4	4.94	0.2997	0.4607	0.1381	0.0761	10.50	-138.68
4	4.94	0.3097	0.4607	0.1427	0.0761	10.85	-146.64
4	4.94	0.3197	0.4607	0.1473	0.0761	11.20	-154.61
4	4.94	0.3297	0.4607	0.1519	0.0761	11.55	-162.57
4	4.94	0.3397	0.4607	0.1565	0.0761	11.90	-170.53
4	4.94	0.3497	0.4607	0.1611	0.0761	12.25	-178.50
4	4.94	0.3597	0.4607	0.1657	0.0761	12.60	-186.46
4	4.94	0.3697	0.4607	0.1703	0.0761	12.95	-194.42
4	4.94	0.3797	0.4607	0.1749	0.0761	13.31	-202.39
4	4.94	0.3897	0.4607	0.1795	0.0761	13.66	-210.35
4	4.94	0.3997	0.4607	0.1841	0.0761	14.01	-218.32
4	4.94	0.4097	0.4607	0.1887	0.0761	14.36	-226.28
4	4.94	0.4197	0.4607	0.1933	0.0761	14.71	-234.24
4	4.94	0.4297	0.4607	0.1979	0.0761	15.06	-242.21
4	4.94	0.4397	0.4607	0.2026	0.0761	15.41	-250.17
4	4.94	0.4497	0.4607	0.2072	0.0761	15.76	-258.14
4	4.94	0.4597	0.4607	0.2118	0.0761	16.11	-266.10
4	4.94	0.4697	0.4607	0.2164	0.0761	16.46	-274.06
4	4.94	0.4797	0.4607	0.2210	0.0761	16.81	-282.03

4	4.94	0.4897	0.4607	0.2256	0.0761	17.16	-289.99
4	4.94	0.4997	0.4607	0.2302	0.0761	17.51	-297.95
4	4.94	0.5097	0.4607	0.2348	0.0761	17.86	-305.92
4	4.94	0.5197	0.4607	0.2394	0.0761	18.21	-313.88
4	4.94	0.5297	0.4607	0.2440	0.0761	18.56	-321.85
4	4.94	0.5397	0.4607	0.2486	0.0761	18.91	-329.81
4	4.94	0.5497	0.4607	0.2532	0.0761	19.26	-337.77
4	4.94	0.5597	0.4607	0.2578	0.0761	19.61	-345.74
4	4.94	0.5697	0.4607	0.2624	0.0761	19.96	-353.70
4	4.94	0.5797	0.4607	0.2670	0.0761	20.31	-361.67
4	4.94	0.5897	0.4607	0.2717	0.0761	20.66	-369.63
4	4.94	0.5997	0.4607	0.2763	0.0761	21.01	-377.59
4	4.94	0.6097	0.4607	0.2809	0.0761	21.36	-385.56
4	4.94	0.6197	0.4607	0.2855	0.0761	21.71	-393.52

Table C14: Range of C_d for set 2 model (Type 44, Q_a = 3.56 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	4.6	0.0597	0.4607	0.0275	0.0727	2.00	43.86
4	4.6	0.0697	0.4607	0.0321	0.0727	2.33	34.46
4	4.6	0.0797	0.4607	0.0367	0.0727	2.67	25.06
4	4.6	0.0897	0.4607	0.0413	0.0727	3.00	15.65
4	4.6	0.0997	0.4607	0.0459	0.0727	3.34	6.25
4	4.6	0.1097	0.4607	0.0505	0.0727	**3.67**	**-3.15**
4	4.6	0.1197	0.4607	0.0551	0.0727	4.01	-12.55
4	4.6	0.1297	0.4607	0.0597	0.0727	4.34	-21.96
4	4.6	0.1397	0.4607	0.0644	0.0727	4.68	-31.36
4	4.6	0.1497	0.4607	0.0690	0.0727	5.01	-40.76
4	4.6	0.1597	0.4607	0.0736	0.0727	5.35	-50.17
4	4.6	0.1697	0.4607	0.0782	0.0727	5.68	-59.57
4	4.6	0.1797	0.4607	0.0828	0.0727	6.02	-68.97
4	4.6	0.1897	0.4607	0.0874	0.0727	6.35	-78.38
4	4.6	0.1997	0.4607	0.0920	0.0727	6.68	-87.78
4	4.6	0.2097	0.4607	0.0966	0.0727	7.02	-97.18
4	4.6	0.2197	0.4607	0.1012	0.0727	7.35	-106.58
4	4.6	0.2297	0.4607	0.1058	0.0727	7.69	-115.99
4	4.6	0.2397	0.4607	0.1104	0.0727	8.02	-125.39
4	4.6	0.2497	0.4607	0.1150	0.0727	8.36	-134.79
4	4.6	0.2597	0.4607	0.1196	0.0727	8.69	-144.20
4	4.6	0.2697	0.4607	0.1242	0.0727	9.03	-153.60
4	4.6	0.2797	0.4607	0.1288	0.0727	9.36	-163.00
4	4.6	0.2897	0.4607	0.1335	0.0727	9.70	-172.41
4	4.6	0.2997	0.4607	0.1381	0.0727	10.03	-181.81
4	4.6	0.3097	0.4607	0.1427	0.0727	10.37	-191.21

4	4.6	0.3197	0.4607	0.1473	0.0727	10.70	-200.62
4	4.6	0.3297	0.4607	0.1519	0.0727	11.04	-210.02
4	4.6	0.3397	0.4607	0.1565	0.0727	11.37	-219.42
4	4.6	0.3497	0.4607	0.1611	0.0727	11.71	-228.82
4	4.6	0.3597	0.4607	0.1657	0.0727	12.04	-238.23
4	4.6	0.3697	0.4607	0.1703	0.0727	12.38	-247.63
4	4.6	0.3797	0.4607	0.1749	0.0727	12.71	-257.03
4	4.6	0.3897	0.4607	0.1795	0.0727	13.05	-266.44
4	4.6	0.3997	0.4607	0.1841	0.0727	13.38	-275.84
4	4.6	0.4097	0.4607	0.1887	0.0727	13.71	-285.24
4	4.6	0.4197	0.4607	0.1933	0.0727	14.05	-294.65
4	4.6	0.4297	0.4607	0.1979	0.0727	14.38	-304.05
4	4.6	0.4397	0.4607	0.2026	0.0727	14.72	-313.45
4	4.6	0.4497	0.4607	0.2072	0.0727	15.05	-322.85
4	4.6	0.4597	0.4607	0.2118	0.0727	15.39	-332.26
4	4.6	0.4697	0.4607	0.2164	0.0727	15.72	-341.66
4	4.6	0.4797	0.4607	0.2210	0.0727	16.06	-351.06
4	4.6	0.4897	0.4607	0.2256	0.0727	16.39	-360.47
4	4.6	0.4997	0.4607	0.2302	0.0727	16.73	-369.87
4	4.6	0.5097	0.4607	0.2348	0.0727	17.06	-379.27
4	4.6	0.5197	0.4607	0.2394	0.0727	17.40	-388.68
4	4.6	0.5297	0.4607	0.2440	0.0727	17.73	-398.08
4	4.6	0.5397	0.4607	0.2486	0.0727	18.07	-407.48
4	4.6	0.5497	0.4607	0.2532	0.0727	18.40	-416.88
4	4.6	0.5597	0.4607	0.2578	0.0727	18.74	-426.29
4	4.6	0.5697	0.4607	0.2624	0.0727	19.07	-435.69
4	4.6	0.5797	0.4607	0.2670	0.0727	19.41	-445.09
4	4.6	0.5897	0.4607	0.2717	0.0727	19.74	-454.50
4	4.6	0.5997	0.4607	0.2763	0.0727	20.07	-463.90
4	4.6	0.6097	0.4607	0.2809	0.0727	20.41	-473.30
4	4.6	0.6197	0.4607	0.2855	0.0727	20.74	-482.71

Table C15: Range of C_d for set 2 model (Type 45, Q_a = 2.98 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	4.2	0.0597	0.4607	0.0275	0.0687	1.89	36.63
4	4.2	0.0697	0.4607	0.0321	0.0687	2.20	26.01
4	4.2	0.0797	0.4607	0.0367	0.0687	2.52	15.40
4	4.2	0.0897	0.4607	0.0413	0.0687	**2.84**	**4.79**
4	4.2	0.0997	0.4607	0.0459	0.0687	3.15	-5.83
4	4.2	0.1097	0.4607	0.0505	0.0687	3.47	-16.44
4	4.2	0.1197	0.4607	0.0551	0.0687	3.79	-27.06
4	4.2	0.1297	0.4607	0.0597	0.0687	4.10	-37.67
4	4.2	0.1397	0.4607	0.0644	0.0687	4.42	-48.29
4	4.2	0.1497	0.4607	0.0690	0.0687	4.74	-58.90
4	4.2	0.1597	0.4607	0.0736	0.0687	5.05	-69.52
4	4.2	0.1697	0.4607	0.0782	0.0687	5.37	-80.13
4	4.2	0.1797	0.4607	0.0828	0.0687	5.68	-90.75
4	4.2	0.1897	0.4607	0.0874	0.0687	6.00	-101.36
4	4.2	0.1997	0.4607	0.0920	0.0687	6.32	-111.98
4	4.2	0.2097	0.4607	0.0966	0.0687	6.63	-122.59
4	4.2	0.2197	0.4607	0.1012	0.0687	6.95	-133.21
4	4.2	0.2297	0.4607	0.1058	0.0687	7.27	-143.82
4	4.2	0.2397	0.4607	0.1104	0.0687	7.58	-154.44
4	4.2	0.2497	0.4607	0.1150	0.0687	7.90	-165.05
4	4.2	0.2597	0.4607	0.1196	0.0687	8.21	-175.67
4	4.2	0.2697	0.4607	0.1242	0.0687	8.53	-186.28
4	4.2	0.2797	0.4607	0.1288	0.0687	8.85	-196.90
4	4.2	0.2897	0.4607	0.1335	0.0687	9.16	-207.51
4	4.2	0.2997	0.4607	0.1381	0.0687	9.48	-218.13
4	4.2	0.3097	0.4607	0.1427	0.0687	9.80	-228.74
4	4.2	0.3197	0.4607	0.1473	0.0687	10.11	-239.36
4	4.2	0.3297	0.4607	0.1519	0.0687	10.43	-249.97
4	4.2	0.3397	0.4607	0.1565	0.0687	10.75	-260.59
4	4.2	0.3497	0.4607	0.1611	0.0687	11.06	-271.20
4	4.2	0.3597	0.4607	0.1657	0.0687	11.38	-281.81
4	4.2	0.3697	0.4607	0.1703	0.0687	11.69	-292.43
4	4.2	0.3797	0.4607	0.1749	0.0687	12.01	-303.04
4	4.2	0.3897	0.4607	0.1795	0.0687	12.33	-313.66
4	4.2	0.3997	0.4607	0.1841	0.0687	12.64	-324.27
4	4.2	0.4097	0.4607	0.1887	0.0687	12.96	-334.89
4	4.2	0.4197	0.4607	0.1933	0.0687	13.28	-345.50
4	4.2	0.4297	0.4607	0.1979	0.0687	13.59	-356.12
4	4.2	0.4397	0.4607	0.2026	0.0687	13.91	-366.73
4	4.2	0.4497	0.4607	0.2072	0.0687	14.22	-377.35
4	4.2	0.4597	0.4607	0.2118	0.0687	14.54	-387.96
4	4.2	0.4697	0.4607	0.2164	0.0687	14.86	-398.58
4	4.2	0.4797	0.4607	0.2210	0.0687	15.17	-409.19

4	4.2	0.4897	0.4607	0.2256	0.0687	15.49	-419.81
4	4.2	0.4997	0.4607	0.2302	0.0687	15.81	-430.42
4	4.2	0.5097	0.4607	0.2348	0.0687	16.12	-441.04
4	4.2	0.5197	0.4607	0.2394	0.0687	16.44	-451.65
4	4.2	0.5297	0.4607	0.2440	0.0687	16.76	-462.27
4	4.2	0.5397	0.4607	0.2486	0.0687	17.07	-472.88
4	4.2	0.5497	0.4607	0.2532	0.0687	17.39	-483.50
4	4.2	0.5597	0.4607	0.2578	0.0687	17.70	-494.11
4	4.2	0.5697	0.4607	0.2624	0.0687	18.02	-504.73
4	4.2	0.5797	0.4607	0.2670	0.0687	18.34	-515.34
4	4.2	0.5897	0.4607	0.2717	0.0687	18.65	-525.96
4	4.2	0.5997	0.4607	0.2763	0.0687	18.97	-536.57
4	4.2	0.6097	0.4607	0.2809	0.0687	19.29	-547.19
4	4.2	0.6197	0.4607	0.2855	0.0687	19.60	-557.80

Table C16: Range of C_d for set 2 model (Type 51, Q_a = 6.24 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	5.6	0.0597	0.4607	0.0275	0.0827	2.27	63.57
4	5.6	0.0697	0.4607	0.0321	0.0827	2.65	57.46
4	5.6	0.0797	0.4607	0.0367	0.0827	3.04	51.36
4	5.6	0.0897	0.4607	0.0413	0.0827	3.42	45.26
4	5.6	0.0997	0.4607	0.0459	0.0827	3.80	39.16
4	5.6	0.1097	0.4607	0.0505	0.0827	4.18	33.05
4	5.6	0.1197	0.4607	0.0551	0.0827	4.56	26.95
4	5.6	0.1297	0.4607	0.0597	0.0827	4.94	20.85
4	5.6	0.1397	0.4607	0.0644	0.0827	5.32	14.74
4	5.6	0.1497	0.4607	0.0690	0.0827	5.70	8.64
4	5.6	0.1597	0.4607	0.0736	0.0827	**6.08**	**2.54**
4	5.6	0.1697	0.4607	0.0782	0.0827	6.46	-3.56
4	5.6	0.1797	0.4607	0.0828	0.0827	6.84	-9.67
4	5.6	0.1897	0.4607	0.0874	0.0827	7.22	-15.77
4	5.6	0.1997	0.4607	0.0920	0.0827	7.60	-21.87
4	5.6	0.2097	0.4607	0.0966	0.0827	7.99	-27.98
4	5.6	0.2197	0.4607	0.1012	0.0827	8.37	-34.08
4	5.6	0.2297	0.4607	0.1058	0.0827	8.75	-40.18
4	5.6	0.2397	0.4607	0.1104	0.0827	9.13	-46.28
4	5.6	0.2497	0.4607	0.1150	0.0827	9.51	-52.39
4	5.6	0.2597	0.4607	0.1196	0.0827	9.89	-58.49
4	5.6	0.2697	0.4607	0.1242	0.0827	10.27	-64.59
4	5.6	0.2797	0.4607	0.1288	0.0827	10.65	-70.70
4	5.6	0.2897	0.4607	0.1335	0.0827	11.03	-76.80
4	5.6	0.2997	0.4607	0.1381	0.0827	11.41	-82.90
4	5.6	0.3097	0.4607	0.1427	0.0827	11.79	-89.00

4	5.6	0.3197	0.4607	0.1473	0.0827	12.17	-95.11
4	5.6	0.3297	0.4607	0.1519	0.0827	12.56	-101.21
4	5.6	0.3397	0.4607	0.1565	0.0827	12.94	-107.31
4	5.6	0.3497	0.4607	0.1611	0.0827	13.32	-113.41
4	5.6	0.3597	0.4607	0.1657	0.0827	13.70	-119.52
4	5.6	0.3697	0.4607	0.1703	0.0827	14.08	-125.62
4	5.6	0.3797	0.4607	0.1749	0.0827	14.46	-131.72
4	5.6	0.3897	0.4607	0.1795	0.0827	14.84	-137.83
4	5.6	0.3997	0.4607	0.1841	0.0827	15.22	-143.93
4	5.6	0.4097	0.4607	0.1887	0.0827	15.60	-150.03
4	5.6	0.4197	0.4607	0.1933	0.0827	15.98	-156.13
4	5.6	0.4297	0.4607	0.1979	0.0827	16.36	-162.24
4	5.6	0.4397	0.4607	0.2026	0.0827	16.74	-168.34
4	5.6	0.4497	0.4607	0.2072	0.0827	17.13	-174.44
4	5.6	0.4597	0.4607	0.2118	0.0827	17.51	-180.55
4	5.6	0.4697	0.4607	0.2164	0.0827	17.89	-186.65
4	5.6	0.4797	0.4607	0.2210	0.0827	18.27	-192.75
4	5.6	0.4897	0.4607	0.2256	0.0827	18.65	-198.85
4	5.6	0.4997	0.4607	0.2302	0.0827	19.03	-204.96
4	5.6	0.5097	0.4607	0.2348	0.0827	19.41	-211.06
4	5.6	0.5197	0.4607	0.2394	0.0827	19.79	-217.16
4	5.6	0.5297	0.4607	0.2440	0.0827	20.17	-223.26
4	5.6	0.5397	0.4607	0.2486	0.0827	20.55	-229.37
4	5.6	0.5497	0.4607	0.2532	0.0827	20.93	-235.47
4	5.6	0.5597	0.4607	0.2578	0.0827	21.31	-241.57
4	5.6	0.5697	0.4607	0.2624	0.0827	21.69	-247.68
4	5.6	0.5797	0.4607	0.2670	0.0827	22.08	-253.78
4	5.6	0.5897	0.4607	0.2717	0.0827	22.46	-259.88
4	5.6	0.5997	0.4607	0.2763	0.0827	22.84	-265.98
4	5.6	0.6097	0.4607	0.2809	0.0827	23.22	-272.09
4	5.6	0.6197	0.4607	0.2855	0.0827	23.60	-278.19

Table C17: Range of C_d for set 2 model (Type 52, Q_a = 5.34 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	5.25	0.0597	0.4607	0.0275	0.0792	2.18	59.23
4	5.25	0.0697	0.4607	0.0321	0.0792	2.54	52.40
4	5.25	0.0797	0.4607	0.0367	0.0792	2.91	45.57
4	5.25	0.0897	0.4607	0.0413	0.0792	3.27	38.74
4	5.25	0.0997	0.4607	0.0459	0.0792	3.64	31.91
4	5.25	0.1097	0.4607	0.0505	0.0792	4.00	25.08
4	5.25	0.1197	0.4607	0.0551	0.0792	4.37	18.25
4	5.25	0.1297	0.4607	0.0597	0.0792	4.73	11.42
4	5.25	0.1397	0.4607	0.0644	0.0792	5.09	4.59
4	5.25	0.1497	0.4607	0.0690	0.0792	**5.46**	**-2.24**
4	5.25	0.1597	0.4607	0.0736	0.0792	5.82	-9.07
4	5.25	0.1697	0.4607	0.0782	0.0792	6.19	-15.90
4	5.25	0.1797	0.4607	0.0828	0.0792	6.55	-22.72
4	5.25	0.1897	0.4607	0.0874	0.0792	6.92	-29.55
4	5.25	0.1997	0.4607	0.0920	0.0792	7.28	-36.38
4	5.25	0.2097	0.4607	0.0966	0.0792	7.65	-43.21
4	5.25	0.2197	0.4607	0.1012	0.0792	8.01	-50.04
4	5.25	0.2297	0.4607	0.1058	0.0792	8.38	-56.87
4	5.25	0.2397	0.4607	0.1104	0.0792	8.74	-63.70
4	5.25	0.2497	0.4607	0.1150	0.0792	9.11	-70.53
4	5.25	0.2597	0.4607	0.1196	0.0792	9.47	-77.36
4	5.25	0.2697	0.4607	0.1242	0.0792	9.84	-84.19
4	5.25	0.2797	0.4607	0.1288	0.0792	10.20	-91.02
4	5.25	0.2897	0.4607	0.1335	0.0792	10.57	-97.85
4	5.25	0.2997	0.4607	0.1381	0.0792	10.93	-104.68
4	5.25	0.3097	0.4607	0.1427	0.0792	11.29	-111.51
4	5.25	0.3197	0.4607	0.1473	0.0792	11.66	-118.34
4	5.25	0.3297	0.4607	0.1519	0.0792	12.02	-125.17
4	5.25	0.3397	0.4607	0.1565	0.0792	12.39	-132.00
4	5.25	0.3497	0.4607	0.1611	0.0792	12.75	-138.82
4	5.25	0.3597	0.4607	0.1657	0.0792	13.12	-145.65
4	5.25	0.3697	0.4607	0.1703	0.0792	13.48	-152.48
4	5.25	0.3797	0.4607	0.1749	0.0792	13.85	-159.31
4	5.25	0.3897	0.4607	0.1795	0.0792	14.21	-166.14
4	5.25	0.3997	0.4607	0.1841	0.0792	14.58	-172.97
4	5.25	0.4097	0.4607	0.1887	0.0792	14.94	-179.80
4	5.25	0.4197	0.4607	0.1933	0.0792	15.31	-186.63
4	5.25	0.4297	0.4607	0.1979	0.0792	15.67	-193.46
4	5.25	0.4397	0.4607	0.2026	0.0792	16.04	-200.29
4	5.25	0.4497	0.4607	0.2072	0.0792	16.40	-207.12
4	5.25	0.4597	0.4607	0.2118	0.0792	16.76	-213.95
4	5.25	0.4697	0.4607	0.2164	0.0792	17.13	-220.78
4	5.25	0.4797	0.4607	0.2210	0.0792	17.49	-227.61

4	5.25	0.4897	0.4607	0.2256	0.0792	17.86	-234.44
4	5.25	0.4997	0.4607	0.2302	0.0792	18.22	-241.27
4	5.25	0.5097	0.4607	0.2348	0.0792	18.59	-248.10
4	5.25	0.5197	0.4607	0.2394	0.0792	18.95	-254.93
4	5.25	0.5297	0.4607	0.2440	0.0792	19.32	-261.75
4	5.25	0.5397	0.4607	0.2486	0.0792	19.68	-268.58
4	5.25	0.5497	0.4607	0.2532	0.0792	20.05	-275.41
4	5.25	0.5597	0.4607	0.2578	0.0792	20.41	-282.24
4	5.25	0.5697	0.4607	0.2624	0.0792	20.78	-289.07
4	5.25	0.5797	0.4607	0.2670	0.0792	21.14	-295.90
4	5.25	0.5897	0.4607	0.2717	0.0792	21.51	-302.73
4	5.25	0.5997	0.4607	0.2763	0.0792	21.87	-309.56
4	5.25	0.6097	0.4607	0.2809	0.0792	22.24	-316.39
4	5.25	0.6197	0.4607	0.2855	0.0792	22.60	-323.22

Table C18: Range of C_d for set 2 model (Type 53, Q_a = 4.40 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	4.81	0.0597	0.4607	0.0275	0.0748	2.06	53.27
4	4.81	0.0697	0.4607	0.0321	0.0748	2.40	45.44
4	4.81	0.0797	0.4607	0.0367	0.0748	2.75	37.61
4	4.81	0.0897	0.4607	0.0413	0.0748	3.09	29.78
4	4.81	0.0997	0.4607	0.0459	0.0748	3.43	21.96
4	4.81	0.1097	0.4607	0.0505	0.0748	3.78	14.13
4	4.81	0.1197	0.4607	0.0551	0.0748	4.12	6.30
4	4.81	0.1297	0.4607	0.0597	0.0748	**4.47**	**-1.53**
4	4.81	0.1397	0.4607	0.0644	0.0748	4.81	-9.35
4	4.81	0.1497	0.4607	0.0690	0.0748	5.16	-17.18
4	4.81	0.1597	0.4607	0.0736	0.0748	5.50	-25.01
4	4.81	0.1697	0.4607	0.0782	0.0748	5.84	-32.84
4	4.81	0.1797	0.4607	0.0828	0.0748	6.19	-40.67
4	4.81	0.1897	0.4607	0.0874	0.0748	6.53	-48.49
4	4.81	0.1997	0.4607	0.0920	0.0748	6.88	-56.32
4	4.81	0.2097	0.4607	0.0966	0.0748	7.22	-64.15
4	4.81	0.2197	0.4607	0.1012	0.0748	7.57	-71.98
4	4.81	0.2297	0.4607	0.1058	0.0748	7.91	-79.80
4	4.81	0.2397	0.4607	0.1104	0.0748	8.26	-87.63
4	4.81	0.2497	0.4607	0.1150	0.0748	8.60	-95.46
4	4.81	0.2597	0.4607	0.1196	0.0748	8.94	-103.29
4	4.81	0.2697	0.4607	0.1242	0.0748	9.29	-111.12
4	4.81	0.2797	0.4607	0.1288	0.0748	9.63	-118.94
4	4.81	0.2897	0.4607	0.1335	0.0748	9.98	-126.77
4	4.81	0.2997	0.4607	0.1381	0.0748	10.32	-134.60
4	4.81	0.3097	0.4607	0.1427	0.0748	10.67	-142.43

4	4.81	0.3197	0.4607	0.1473	0.0748	11.01	-150.25
4	4.81	0.3297	0.4607	0.1519	0.0748	11.36	-158.08
4	4.81	0.3397	0.4607	0.1565	0.0748	11.70	-165.91
4	4.81	0.3497	0.4607	0.1611	0.0748	12.04	-173.74
4	4.81	0.3597	0.4607	0.1657	0.0748	12.39	-181.56
4	4.81	0.3697	0.4607	0.1703	0.0748	12.73	-189.39
4	4.81	0.3797	0.4607	0.1749	0.0748	13.08	-197.22
4	4.81	0.3897	0.4607	0.1795	0.0748	13.42	-205.05
4	4.81	0.3997	0.4607	0.1841	0.0748	13.77	-212.88
4	4.81	0.4097	0.4607	0.1887	0.0748	14.11	-220.70
4	4.81	0.4197	0.4607	0.1933	0.0748	14.46	-228.53
4	4.81	0.4297	0.4607	0.1979	0.0748	14.80	-236.36
4	4.81	0.4397	0.4607	0.2026	0.0748	15.14	-244.19
4	4.81	0.4497	0.4607	0.2072	0.0748	15.49	-252.01
4	4.81	0.4597	0.4607	0.2118	0.0748	15.83	-259.84
4	4.81	0.4697	0.4607	0.2164	0.0748	16.18	-267.67
4	4.81	0.4797	0.4607	0.2210	0.0748	16.52	-275.50
4	4.81	0.4897	0.4607	0.2256	0.0748	16.87	-283.33
4	4.81	0.4997	0.4607	0.2302	0.0748	17.21	-291.15
4	4.81	0.5097	0.4607	0.2348	0.0748	17.56	-298.98
4	4.81	0.5197	0.4607	0.2394	0.0748	17.90	-306.81
4	4.81	0.5297	0.4607	0.2440	0.0748	18.24	-314.64
4	4.81	0.5397	0.4607	0.2486	0.0748	18.59	-322.46
4	4.81	0.5497	0.4607	0.2532	0.0748	18.93	-330.29
4	4.81	0.5597	0.4607	0.2578	0.0748	19.28	-338.12
4	4.81	0.5697	0.4607	0.2624	0.0748	19.62	-345.95
4	4.81	0.5797	0.4607	0.2670	0.0748	19.97	-353.78
4	4.81	0.5897	0.4607	0.2717	0.0748	20.31	-361.60
4	4.81	0.5997	0.4607	0.2763	0.0748	20.65	-369.43
4	4.81	0.6097	0.4607	0.2809	0.0748	21.00	-377.26
4	4.81	0.6197	0.4607	0.2855	0.0748	21.34	-385.09

Table C19: Range of C_d for set 2 model (Type 54, Q_a = 3.56 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	4.51	0.0597	0.4607	0.0275	0.0718	1.97	44.56
4	4.51	0.0697	0.4607	0.0321	0.0718	2.30	35.27
4	4.51	0.0797	0.4607	0.0367	0.0718	2.63	25.99
4	4.51	0.0897	0.4607	0.0413	0.0718	2.97	16.70
4	4.51	0.0997	0.4607	0.0459	0.0718	3.30	7.41
4	4.51	0.1097	0.4607	0.0505	0.0718	**3.63**	**-1.87**
4	4.51	0.1197	0.4607	0.0551	0.0718	3.96	-11.16
4	4.51	0.1297	0.4607	0.0597	0.0718	4.29	-20.45
4	4.51	0.1397	0.4607	0.0644	0.0718	4.62	-29.73
4	4.51	0.1497	0.4607	0.0690	0.0718	4.95	-39.02
4	4.51	0.1597	0.4607	0.0736	0.0718	5.28	-48.31
4	4.51	0.1697	0.4607	0.0782	0.0718	5.61	-57.59
4	4.51	0.1797	0.4607	0.0828	0.0718	5.94	-66.88
4	4.51	0.1897	0.4607	0.0874	0.0718	6.27	-76.17
4	4.51	0.1997	0.4607	0.0920	0.0718	6.60	-85.45
4	4.51	0.2097	0.4607	0.0966	0.0718	6.93	-94.74
4	4.51	0.2197	0.4607	0.1012	0.0718	7.26	-104.03
4	4.51	0.2297	0.4607	0.1058	0.0718	7.59	-113.31
4	4.51	0.2397	0.4607	0.1104	0.0718	7.92	-122.60
4	4.51	0.2497	0.4607	0.1150	0.0718	8.26	-131.89
4	4.51	0.2597	0.4607	0.1196	0.0718	8.59	-141.17
4	4.51	0.2697	0.4607	0.1242	0.0718	8.92	-150.46
4	4.51	0.2797	0.4607	0.1288	0.0718	9.25	-159.75
4	4.51	0.2897	0.4607	0.1335	0.0718	9.58	-169.03
4	4.51	0.2997	0.4607	0.1381	0.0718	9.91	-178.32
4	4.51	0.3097	0.4607	0.1427	0.0718	10.24	-187.61
4	4.51	0.3197	0.4607	0.1473	0.0718	10.57	-196.89
4	4.51	0.3297	0.4607	0.1519	0.0718	10.90	-206.18
4	4.51	0.3397	0.4607	0.1565	0.0718	11.23	-215.46
4	4.51	0.3497	0.4607	0.1611	0.0718	11.56	-224.75
4	4.51	0.3597	0.4607	0.1657	0.0718	11.89	-234.04
4	4.51	0.3697	0.4607	0.1703	0.0718	12.22	-243.32
4	4.51	0.3797	0.4607	0.1749	0.0718	12.55	-252.61
4	4.51	0.3897	0.4607	0.1795	0.0718	12.88	-261.90
4	4.51	0.3997	0.4607	0.1841	0.0718	13.21	-271.18
4	4.51	0.4097	0.4607	0.1887	0.0718	13.54	-280.47
4	4.51	0.4197	0.4607	0.1933	0.0718	13.88	-289.76
4	4.51	0.4297	0.4607	0.1979	0.0718	14.21	-299.04
4	4.51	0.4397	0.4607	0.2026	0.0718	14.54	-308.33
4	4.51	0.4497	0.4607	0.2072	0.0718	14.87	-317.62
4	4.51	0.4597	0.4607	0.2118	0.0718	15.20	-326.90
4	4.51	0.4697	0.4607	0.2164	0.0718	15.53	-336.19
4	4.51	0.4797	0.4607	0.2210	0.0718	15.86	-345.48

4	4.51	0.4897	0.4607	0.2256	0.0718	16.19	-354.76
4	4.51	0.4997	0.4607	0.2302	0.0718	16.52	-364.05
4	4.51	0.5097	0.4607	0.2348	0.0718	16.85	-373.34
4	4.51	0.5197	0.4607	0.2394	0.0718	17.18	-382.62
4	4.51	0.5297	0.4607	0.2440	0.0718	17.51	-391.91
4	4.51	0.5397	0.4607	0.2486	0.0718	17.84	-401.20
4	4.51	0.5497	0.4607	0.2532	0.0718	18.17	-410.48
4	4.51	0.5597	0.4607	0.2578	0.0718	18.50	-419.77
4	4.51	0.5697	0.4607	0.2624	0.0718	18.83	-429.06
4	4.51	0.5797	0.4607	0.2670	0.0718	19.17	-438.34
4	4.51	0.5897	0.4607	0.2717	0.0718	19.50	-447.63
4	4.51	0.5997	0.4607	0.2763	0.0718	19.83	-456.92
4	4.51	0.6097	0.4607	0.2809	0.0718	20.16	-466.20
4	4.51	0.6197	0.4607	0.2855	0.0718	20.49	-475.49

Table C20: Range of C_d for set 2 model (Type 55, Q_a = 2.98 l/s)

s (cm)	h (cm)	Cd	m	Co	x	Qt (l/s)	% Error
4	4.38	0.0597	0.4607	0.0275	0.0705	1.94	34.97
4	4.38	0.0697	0.4607	0.0321	0.0705	2.26	24.08
4	4.38	0.0797	0.4607	0.0367	0.0705	2.59	13.18
4	4.38	0.0897	0.4607	0.0413	0.0705	**2.91**	**2.29**
4	4.38	0.0997	0.4607	0.0459	0.0705	3.24	-8.60
4	4.38	0.1097	0.4607	0.0505	0.0705	3.56	-19.50
4	4.38	0.1197	0.4607	0.0551	0.0705	3.89	-30.39
4	4.38	0.1297	0.4607	0.0597	0.0705	4.21	-41.28
4	4.38	0.1397	0.4607	0.0644	0.0705	4.53	-52.18
4	4.38	0.1497	0.4607	0.0690	0.0705	4.86	-63.07
4	4.38	0.1597	0.4607	0.0736	0.0705	5.18	-73.96
4	4.38	0.1697	0.4607	0.0782	0.0705	5.51	-84.86
4	4.38	0.1797	0.4607	0.0828	0.0705	5.83	-95.75
4	4.38	0.1897	0.4607	0.0874	0.0705	6.16	-106.64
4	4.38	0.1997	0.4607	0.0920	0.0705	6.48	-117.53
4	4.38	0.2097	0.4607	0.0966	0.0705	6.81	-128.43
4	4.38	0.2197	0.4607	0.1012	0.0705	7.13	-139.32
4	4.38	0.2297	0.4607	0.1058	0.0705	7.46	-150.21
4	4.38	0.2397	0.4607	0.1104	0.0705	7.78	-161.11
4	4.38	0.2497	0.4607	0.1150	0.0705	8.11	-172.00
4	4.38	0.2597	0.4607	0.1196	0.0705	8.43	-182.89
4	4.38	0.2697	0.4607	0.1242	0.0705	8.75	-193.79
4	4.38	0.2797	0.4607	0.1288	0.0705	9.08	-204.68
4	4.38	0.2897	0.4607	0.1335	0.0705	9.40	-215.57
4	4.38	0.2997	0.4607	0.1381	0.0705	9.73	-226.47
4	4.38	0.3097	0.4607	0.1427	0.0705	10.05	-237.36

4	4.38	0.3197	0.4607	0.1473	0.0705	10.38	-248.25
4	4.38	0.3297	0.4607	0.1519	0.0705	10.70	-259.14
4	4.38	0.3397	0.4607	0.1565	0.0705	11.03	-270.04
4	4.38	0.3497	0.4607	0.1611	0.0705	11.35	-280.93
4	4.38	0.3597	0.4607	0.1657	0.0705	11.68	-291.82
4	4.38	0.3697	0.4607	0.1703	0.0705	12.00	-302.72
4	4.38	0.3797	0.4607	0.1749	0.0705	12.33	-313.61
4	4.38	0.3897	0.4607	0.1795	0.0705	12.65	-324.50
4	4.38	0.3997	0.4607	0.1841	0.0705	12.97	-335.40
4	4.38	0.4097	0.4607	0.1887	0.0705	13.30	-346.29
4	4.38	0.4197	0.4607	0.1933	0.0705	13.62	-357.18
4	4.38	0.4297	0.4607	0.1979	0.0705	13.95	-368.08
4	4.38	0.4397	0.4607	0.2026	0.0705	14.27	-378.97
4	4.38	0.4497	0.4607	0.2072	0.0705	14.60	-389.86
4	4.38	0.4597	0.4607	0.2118	0.0705	14.92	-400.75
4	4.38	0.4697	0.4607	0.2164	0.0705	15.25	-411.65
4	4.38	0.4797	0.4607	0.2210	0.0705	15.57	-422.54
4	4.38	0.4897	0.4607	0.2256	0.0705	15.90	-433.43
4	4.38	0.4997	0.4607	0.2302	0.0705	16.22	-444.33
4	4.38	0.5097	0.4607	0.2348	0.0705	16.55	-455.22
4	4.38	0.5197	0.4607	0.2394	0.0705	16.87	-466.11
4	4.38	0.5297	0.4607	0.2440	0.0705	17.19	-477.01
4	4.38	0.5397	0.4607	0.2486	0.0705	17.52	-487.90
4	4.38	0.5497	0.4607	0.2532	0.0705	17.84	-498.79
4	4.38	0.5597	0.4607	0.2578	0.0705	18.17	-509.69
4	4.38	0.5697	0.4607	0.2624	0.0705	18.49	-520.58
4	4.38	0.5797	0.4607	0.2670	0.0705	18.82	-531.47
4	4.38	0.5897	0.4607	0.2717	0.0705	19.14	-542.36
4	4.38	0.5997	0.4607	0.2763	0.0705	19.47	-553.26
4	4.38	0.6097	0.4607	0.2809	0.0705	19.79	-564.15
4	4.38	0.6197	0.4607	0.2855	0.0705	20.12	-575.04