

Ministry of higher education and scientific research

University of technology

Building and construction department

Water and dams branch

Design siphon system

Research presented to the University of technology building and construction department as a part of their degree requirement in civil engineering

Presented by

Ghasaq M. Mohammed

Supervised by

Asst.prof. Haider alwash

2013-2014

Dedication

Dedicate this research to the person I carry his name with pride

my dear father,

Mahmood Abu Teman...

To the fountain of patience, optimism and hope, dear mom...

To my strength and my refuge after God, Mustafa and Anber...

Gratitude and appreciation and love to those who carried the

holiest message in life...

Who paved the way science and knowledge to us...

All our masters Distinguished

Nomenclature	2
Abstract	4
Chapter one	5
Introduction	6
The aim of the research	8
Chapter two	9
Chapter three	12
Structural components of siphons	13
Design siphon system	17
Hydraulic design considerations	18
Siphon spillway	25
Illustrative example	27
Chapter four	33
References	35

Nomenclature

S: the slope of siphon (dimensionless).

V: the velocity of the flow through the siphon barrel (m/s).

h_f : the total head losses which equals to the difference between the upstream and downstream water level (m).

b: span of siphon (m).

d: height of siphon (m).

Y: elevation of water (m).

D_s : diameter of pipe for siphon (m).

L: length of the barrel (m).

R: hydraulic mean radius of the barrel (m).

V_a : velocity of approach and is often neglected (m/s).

f_2 : is a coefficient such that the losses of head through the barrel due to surface friction,

F1: constant for elbows losses.

F2: constant for bend losses

R1: Depth of scour below water level (m).

q: Discharge / meter width ($m^3/m.s$).

Ca: constant for showing irrigation canal ($Ca=1$) or drainage canal ($Ca=2$).

Q: discharge (m^3/sec).

L: length of inverted siphon (m).

K_e : entrance coefficient.

K_o : outlet coefficient.

K_s : screen coefficient.

K_{el} : elbows coefficient

K_{ex} : expansion coefficient

K_{con} : contraction coefficient

V_c : velocity of canal (m/sec)

Y_e : depth of water in canal (m).

D :Diameter of pipe (m)

d :height of box section (m)

f :Lacey silt factor (m)

f_1 :coefficient of head losses at entry (m)

K_1 :Entrance coefficient (m)

K_2 :Outlet coefficient (m)

Abstract

Siphons used to convey canal water by gravity under roads, railroads, other structures, various types of drainage channels, and depressions. A siphon is closed conduit designed to run full and under pressure, the structure should operate without excess head flowing design capacity.

Siphons usually made of circular concrete pipes or PVC, also it maybe have rectangular cross-section, it is connecting two canals reaches in series. There are many types of siphons with many structural components, the aim of this research is to study the types of siphon and its components and to choose the suitable steps to design the siphon system.

One of illustrative example was taken as a case of study.

This is showing the steps of the design of siphon and its components.