DETERMINATION OF UNTRADITIONAL SEWERAGE SYSTEMS DESIGN CRITERIA ACCORDING TO EGYPTIAN CONDITIONS

A Thesis
Submitted to the Faculty of Engineering
Ain Shams University for the Fulfillment
of the Requirement of Ph. Degree
in Civil Engineering

Prepared by

ENG. HOSSAM MOSTAFA HUSSIEN AHMED
M.Sc. of Civil Engineering, August 2007
Faculty of Engineering, Ain Shams University

Supervisors

Prof. Dr. MOHAMED EL HOSSIENY EL NADI
Professor of Sanitary & Environmental Engineering
Faculty of Engineering, Ain Shams University, Cairo, EGYPT

Prof. Dr. MAHMOUD MOHAMED ABDEL AZEEM
Professor of Sanitary & Environmental Engineering
Faculty of Engineering, Ain Shams University, Cairo, EGYPT

2013

DETERMINATION OF UNTRADITIONAL SEWERAGE SYSTEMS DESIGN CRITERIA ACCORDING TO EGYPTIAN CONDITIONS

A Thesis For

The Ph. Degree in Civil Engineering

(SANITARY ENGINEERING)

by

ENG. HOSSAM MOSTAFA HUSSIEN AHMED

M.Sc. of Civil Engineering, August 2007

Faculty of Engineering, Ain Shams University

THESIS APPROVAL

EXAMINERS COMMITTEE **SIGNATURE**

Prof. Dr. Mostafa Mohamed Abdel- Warith ----------------

Professor of Environmental Engineering

Faculty of Engineering, Ryerson University, Toronto Canada

Prof. Dr. Mohamed Shaaban Negm -----------------

Professor of Sanitary & Environmental Engineering

Faculty of Engineering, Ain Shams University

Prof. Dr. Mohamed El Hosseiny El Nadi -----------------

Professor of Sanitary & Environmental Engineering

Faculty of Engineering, Ain Shams University

Prof. Dr. Mahmoud Mohamed Abdel Azeem -----------------

Professor of Sanitary & Environmental Engineering

Faculty of Engineering, Ain Shams University

Date:- ---/--/2013

DEDICATION

I wish to dedicate this work to who suffered to educate, prepare, build capacity and help myself to be as I am,

TO MY MOTHER AND MY FATHER

Also thanks

TO MY WIFE
for her encouragement and support to complete this work

STATEMENT

This dissertation is submitted to Ain Shams University, Faculty of Engineering for the degree of Ph.D in Civil Engineering.

The work included in this thesis was carried out by the author in the department of Public Works, Faculty of Engineering, Ain Shams University, from January 2008 to January 2013.

No part of the thesis has been submitted for a degree or a qualification at any other University or Institution.

The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others

Date: -	---/-- /2013
Signature: -	----------------
Name: -	***HOSSAM MOSTAFA HUSSIEN AHMED***

ACKNOWLEDGMENT

The candidate is deeply grateful to **Prof. Dr. Mohamed El Hosseiny Abdel Rhman EL Nadi**, *Professor of Sanitary and Environmental Engineering, Faculty of Engineering, Ain Shams University, for suggesting the problem, help, encourage, co-operation sponsoring and patient advising during preparation of this research.*

And deep thanks to **Prof. Dr. Mahmoud Mohamed Abdel Azeem,** *Professor of sanitary and Environmental Engineering, Ain Shams University, for his help, and co-operation during the preparation of this research.*

ABSTRACT

NAME :- **HOSSAM MOSTAFA HUSSIEN AHMED**

Title :- "DETERMINATION OF UNTRADITIONAL SEWERAGE SYSTEMS DESIGN CRITERIA ACCORDING TO EGYPTIAN CONDITIONS".

Faculty : Faculty of Engineering, Ain Shams University
Specialty : Civil Eng., Public Works, Sanitary Engineering

Summary :

This study aims to produce local wastewater flow factors (peaking and minimum) for sewerage systems of Egyptian rural areas according to the population & average wastewater flow rate. In order to produce local factors; data of wastewater flow rate through one year for 12 villages in 3 governorates (Kfr El Sheikh, El Menia, and Qena) were measured and recorded. Then two groups of models were produced as follow:

Group (A) consists of four flow factors models according to population.

Group (B) consists of four flow factors models according to average wastewater flow rates. Four models for each group are: Hourly Peaking Flow Factor (HPF), Hourly Minimum Flow Factors (HMF), Daily Peaking Flow Factors (DPF), and Daily Minimum Flow Factor (DMF).

The produced wastewater flow factors were evaluated and compared with Egyptian code models and widely used wastewater flow factors models.

Wastewater flow factors obtained from study produced models give nearest values to the field results with percentages of errors between ± 1 to 20 %, and ± 1 to 25% for groups (A) and (B) respectively, in the other hand, the wastewater flow factors obtained from Egyptian code models and widely used wastewater flow factors models give percentages of errors more than 101%, and 150% for groups (A) and (B) respectively. Also, the comparison between HPF obtained from Egyptian Code models, and HPF obtained from study produced model indicates that the produced HPF can be obtained by multiplying E.C HPF models in a reduction factor of 0.76.

So, this study recommends using the produced wastewater flow factors models in the design of sewerage systems in Egyptian rural areas which will reduce size of sewerage system elements such as pipes and pumps and achieve bigger operation and maintenance efficiency and saving costs, especially with the lacking of wastewater facilities and investments in these areas.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES