شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد أعدت دون أية تغيرات

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تحفظ هذه الأفلام بعيدا عن الغبار

في درجة حرارة من ١٥-٢٥ مئوية ورطوبة نسبية من ٢٠-٤٠%

To be Kept away from Dust in Dry Cool place of 15-25- c and relative humidity 20-40%

بعض الوثائق الاصلية تالفة

بالرسالة صفحات لم ترد بالاصل

EL-Mansoura University
Faculty of Engineering
Public Works Dept.

OPTIMIZATION OF SMALL BORE SEWER SYSTEM DESIGN

BY

Alaa Eldin Abdel Halim Ismaiel Keshk

B. Sc. Civil Engineering, El-Mansoura University, 1990

A Thesis

Submitted in Partial Fulfillment for the Requirements
of the Degree of Master of Science in Engineering.

In

Puplic Works Engineering

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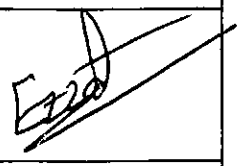
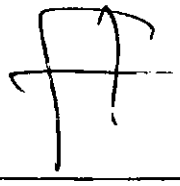
2	*Prof. Dr.* **Ezat Abdel Shafy**	Prof. of Sanitary Engineering Faculty of Engineering Cairo University	
3	*Prof. Dr.* **Ahmed Fadel Ahmed Ashry**	Prof. of Sanitary Engineering Head of Public Works Dept. Faculty of Engineering El-Mansoura University	

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ALAA ELDIN A. I. KESHK

SUMMARY

Rural and small communities, by their very geography and development, have a number of problems that make the collection and treatment of wastewater a difficult undertaking. The cost of conventional gravity collection system in rural and small communities was found to dwarf the cost of treatment and disposal.

Small Bore Sewers System can provide an economical way to upgrade existing sanitation facilities to a level of service comparable to conventional sewers. Unlike conventional sewers, primary treatment is provided at each connection and only the settled water is collected.

The objective of this study is to develop a generalized optimization design model for the proposed *Small Bore Sewers System*. To develop such mathematical model, many variables need to be defined and many constraints have to be written in proper format. The optimization algorithm is a mixed integer programming package called LINGO (Language for Interactive General Optimization) and nonlinear programming package called GINO (General Interactive Optimizer). The Two optimization algorithms were performed to give the optimum design (least-cost) for the small bore sewers network, septic tanks, and the least cost of treatment plant. A software has been developed for the *Small Bore Sewers Network Design* called **(SBS)**. **SBS** has been created to give the optimum design (least-cost), and draw the *Small Bore Sewers Network.* This software is specifically designed for running under *WINDOWS.* It has been structured and developed by using *C* ++ as an Object-Oriented Programming Language(OOP) integrated with *Linear Programming Optimization Language* (LINGO), and *AUTOCAD* software package. SBS improves productivity by helping an engineer select best possible design in a short amount of time. The software was designed to be used by planning engineers who are not necessarily skilled at mathematical programming.

The present thesis falls into five chapters as follows:

CHAPTER ONE

Provides an overview of prior attempts at developing optimization programs for sewerage systems. Section one of this chapter concentrates on the mathematical programming models to achieve the optimal (least-cost) design solution for a sewer system. Section two introduces previous attempts at using *Small Bore Sewers System* as a low cost sewerage for rural communities.

CHAPTER TWO

This chapter describes two models. The first is a Mixed Integer Programming (MIP) Model. This model gives the optimum design (least-cost) for a Small Bore Sewers Network. The second model is a Nonlinear Programming Model. The model gives the optimum design(least-cost) for a Septic Tank and Treatment Plant. The two models complete each other for over all the Small Bore Sewers System economics and design performance.

CHAPTER THREE

The aim of this chapter is to present the software, **(SBS),** created to give the optimum design (least-cost), and draw the *Small Bore Sewers Network.*

CHAPTER FOUR

Sums up the whole thing by listing the results of applied example.

CHAPTER FIVE

Is a conclusion and summary of the finding of the thesis.

LIST OF FIGURES

LIST OF TABLES