STUDY OF NON-METALLIC MATERIAL EXPOSED TO THE SEWERAGE ENVIRONMENT

By

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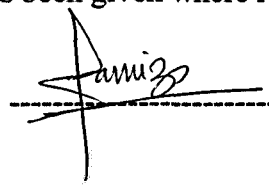
Report is submitted as
the requirement for the degree of
Bachelor Engineering (Hons) (Civil)

UNIVERSITI TEKNOLOGI MARA
2006

DECLARATION BY THE CANDIDATE

I Siti Famiza binti Zakaria, 2004286623 confirm that the work is my own and that appropriate credit has been given where reference has been made to the work of others.



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ACKNOWLEDGEMENT

Praise be to Allah s.w.t, the most Beneficent, Merciful, Gracious for His consent for successfully completed my Final Year Project.

Firstly, I would like to express my sincere gratitude to my KJC 537 Final Year Project supervisor, Assoc.Prof. Ir. Dr. Suhaimi bin Abdul Talib of Faculty of Civil Engineering, UITM Shah Alam for his continuous support and the guidelines in preparing and completing this Final Year Project. His invaluable assistance through constructive comments is instrumental for the completion of this study. I would also like to acknowledgement to Prof. Madya Ir Dr. Aminuddin bin Baki for his helps in giving advice and encouragement to complete this Final Year Project.

I would also like to express my gratitude to Mrs Khor Bee Chin and En Basar from Indah Water Konsortium Sdn. Bhd and laboratory staff at Civil Engineering Faculty, En Razman and En Saiful, laboratory staff at Mechanical Engineering Faculty, En Mohd and En Ziyadi and also laboratory staff at Applied Science Faculty, En Sham, Cik Nurul and En. Kadim for their cooperation to complete this Final Year Project.

Finally, I would like to express special gratitude to my parent for their persistent support during my study in UITM Shah Alam especially in giving their encouragement and moral support. Thanks also to all my friends for their helpful and understanding in completion of this Final Year Project. The guidance is greatly appreciated.

Siti Famiza binti Zakaria
November 2006

ABSTRACT

Nowadays, metallic and non-metallic components are used in sewerage facilities in Malaysia. The sewerage environment is very corrosive and provides real challenges to engineers in specifying materials that are durable when exposed to such environment. Many new materials have been introduced to be used in sewerage facilities. Further to this case, many non-metallic materials are used to replace metallic materials in sewerage facilities. It has been observed that these non-metallic materials have lower service life in Malaysian environment compared to their design life. The performances of these materials have been proven to be satisfactory in many countries but failed prematurely when applied in Malaysia.

Therefore, the purpose of this study is to study on non-metallic material performance in Malaysian sewerage environment to provide a better understanding on performance and failure mechanisms of non-metallic materials. The research is to identify types of failures for various non-metallic components in sewerage facilities, to identify chemical composition of selected non-metallic material need in the sewerage facilities, to evaluate the strength characteristic of selected non-metallic component at failure and lastly to establish the deterioration rate of selected material used in Malaysian sewerage facilities.

This study is based on field and laboratory study. Field study includes visits to sewerage facilities identify the types of failures for various non-metallic components. Laboratory study will focus on tensile tests and Fourier Transform Infrared Spectroscopy (FTIR) tests on selected new and deteriorated component, namely chains and scraper. These will then be compared with the original specification of the components provided by IWK. Further to these tests, the deterioration rate of these components will be established.

Result has shown that modes of failure of non-metallic components can divided into two which is physical and chemical failure. Test using FTIR were meant to identify chemical composition of selected non-metallic components not achieved because of the results of FTIR cannot analyzed. On the other hand, tensile tests conducted successfully established the strength of chain and scraper components. The two new chain samples provided by IWK had tensile strength in the range 5.27-5.57 MPa. While tensile strength for deteriorated chain is 4.58 MPa for Type 1 chain. Test on scrapers established the tensile strength to be range 332.61-408.56 MPa. This study established that the deterioration rate for the chain material is 1.764 MPa/ year and the deterioration rate for the scraper material is 90.976 MPa/year.

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