ACKNOWLEDGEMENT

The thesis is the result of continuous interaction between my guides Prof. (Dr.) A.V. Shroff and Prof. (Dr.) D.L. Shah and the author. Development of advanced theory and Procurement of newly developed drain materials used in the research is due to consistent support of my guices. Author owes a deep sense of gratitude to them for their invaluable direction, indefatigable zeal and the meticulous attention to all the facets of research work.

Author wishes to thank Prof. (Dr.) A.N. Misra, Dean, Faculty of Technology and Engineering, The M.S. University of Baroda for providing research facility and grant for the present research work.

Author wishes to thank Prof. (Dr.) I.I. Pandya, Head, Applied Mechanics Dept. and Prof. (Dr.) S.C. Patodi, Ex. head, Applied Mechanics Dept, Prof. (Dr.) K.R. Biyani, Ex. Head, Applied Mechanics Dept, Faculty of Technology and Engineering, The M.S. University of Baroda for providing all research facility during present research work.

Author wishes to thank Prof. M.N. Patel, Principal, L.D. College of Engineering and Prof. R.M. Manvar, Head, Applied Mechanics Dept., Prof. (Dr.) R.K. Gajjar, Ex. Head, Applied Mechanics Dept, L.D. College of Engineering, Ahmedabad and Ph.D & PG Dean (GTU) for providing all research facility and motivation during present research work.

Author is highly greatful to Department of Technical Education (DTE), Government of Gujrat for necessary permission and extending all research facility during present research work.

Author wishes to thank Prof. K.S. Agarwal, Ex. Principal, Polytechnic, The M.S. University of Baroda and Prof. P.J. Amin, Ex. Head, Applied Mechanics Dept., Prof. M.V. Marathe, Ex. Head, Applied Mechanics Dept., The M.S. University of Baroda for providing all research facility during present research work.

The author is indebted to Prof. (Dr.) A.P. Verma, of Mathematics Department, SVNIT, Surat for his precious guidance in theoretical work, especially in mathematical formulations and for providing valuable comments.
Author is benefited from supplement of research papers and the discussions of his research with Dr. N.H. Joshi, Associate Professor, Applied Mechanics Dept.

Author wishes to thank his respected teachers notably Prof. R.M. Bhagia, Dr. H.J. Shah, Dr. Bimal Shah, Dr. J.D. Rathod, Dr. N.K. Solanki, Shri G.S. Doiphode, Shri M.K. Maroliya, Shri V.R. Patel and Shri L.S. Thakur for their suggestions and help.

Author wishes to thank his respected teachers and colleagues notably Shri S.B. Bhagwat, Ms. D.S. Ghelani, Shri S.M. Patel, Shri M.M. Patel, Shri D.P. Shah, Shri M.J. Jethwa, Mrs. S.N. Pandya, Shri H.K. Patel, Mrs. Deepa Prabhu, Shri L.D. Dheman, Applied Mechanics Dept., Polytechnic, MSU for their suggestions and help.

Author wishes to express sincere thanks to his colleagues notably Prof. (Dr.) H.S. Patel, Prof. (Dr.) B.J. Shah, Prof. (Dr.) N.K. Arora, Prof. (Dr.) S.P. Dave, Prof. C.S. Sanghvi, Prof. B.A. Vyas, Prof. M.G. Vanza, Prof. P.G. Patel, Prof. A.J. Shah, Prof. M.D. Vakil, Prof. K.R. Parmar, Applied Mechanics Dept., L.D. College of Engineering, Ahmedabad

Author wishes to express sincere thanks to his colleagues and friends Prof. CD. Patel, Prof. C.N. Patel and Prof. Poonam Modi, Applied Mechanics Dept., L.D. College of Engineering, Ahmedabad.

Special thanks to my dear friends Vishal Arekar, Kannan Iyer, Kanan Salat and P.G. Students Tasneem Khan, Pritam Patil, Ekta Shah for their inspiration and help during the research.

Author wishes to express his appreciation to the laboratory staff namely Shri Ashok Parmar, Shri H.M. Patel, Shri Yogesh Pawar and Shri Milind Dave, Applied Mechanics Dept, MSU.

Author wishes to express his appreciation to the laboratory staff namely Shri Neelam Joshi, Sanjay Jadhav , Shri Chiraq Pagedar and Shri Raju Patel, Applied Mechanics Dept, Polytechnic, MSU.

Author is thankful to Department of Metallurgy and Department of Textile Engineering, The M.S. University of Baroda for providing necessary testing facilities during the research.
Author is thankful to Department of Pharmacy and Department of Civil Engineering for providing distilled water for the testing.

Author is thankful to M/s TCR Advanced Engg Pvt. Ltd, GIDC, Vadodara for providing research help in Scanning Electron Microscopy and use of MIC software.

Author is grateful to Mr. Gajjarkaka of TAIRO, Faculty of Technology and Engineering, The M.S University of Baroda for their valuable help in preparing experimental set ups.

The accomplishment of the present research work is due to inexpressible and invaluable contribution of Madam Meenaben Shroff.

Special thanks to my dear brother and sisters for their rich motivation.

The present work is possible due to inexpressible and invaluable contribution of my wife, Krishna and son Rasesh and particularly my nephew Nishant.

The author extends his sincere gratitude to all who have directly or indirectly contributed during the research work.