MANUAL ON
SEWERAGE AND SEWAGE
TREATMENT
(SECOND EDITION)

Prepared by:
THE EXPERT COMMITTEE

Constituted by:
THE GOVERNMENT OF INDIA

CENTRAL PUBLIC HEALTH
AND ENVIRONMENTAL ENGINEERING ORGANISATION

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FOREWORD

Safe water supply and hygienic sanitation facilities are the two basic essential amenities the community needs on a top priority for healthy living. While provision of safe drinking water takes precedence in the order of provision of basic amenities to community, the importance of hygienic sanitation facilities through low cost on-site sanitation, conventional sewerage and sewage treatment can no longer be allowed to lag behind, as about 80% of water used by the community comes out of houses in the form of waste water which unless properly collected, conveyed, treated and safely disposed of may eventually pollute our precious water resources and cause environmental degradation.

As of now about 45% of urban population has been provided with reasonable hygienic sanitation facilities in our country and as such there is still much to accomplish so as to reach 100% coverage. While it is necessary to adopt conventional sewerage and treatment methods in our metro and mega cities, it is economical to go in for low cost option wherever feasible particularly in small and medium towns. Yet another important area which needs the urgent attention of our Public Health and Environmental Engineers is possibility of re-use and recycling of waste water after necessary treatment for various beneficial uses so as to reduce the ever increasing demand for fresh water.

It is hoped the revised Manual on Sewerage and Sewage Treatment brought out by the Central Public Health and Environmental Engineering Organisation of this Ministry will meet the professional needs of the practising Engineers dealing with sanitation sector in the country for achieving the goal of "sanitation for all" within a reasonable time frame.

(SHEILA KAUL)
PREFACE

The first Manual on Sewerage and Sewage Treatment was published by the erstwhile Ministry of Works & Housing (presently Ministry of Urban Development) on the basis of recommendations of an Expert committee in 1977. The said Manual has been in use widely by field Engineers who are engaged in the field of sewerage and sewage treatment. However, over a period of time there has been an advancement in the technology and as such the need for revising and updating the said manual has been keenly felt for quite some time. The conference on Mid-Decade Review of Water Decade Programme held in October, 1985 recommended the setting up of Expert Committee for undertaking this task. Accordingly the Ministry of Urban Development, Govt. of India constituted an Expert Committee in December, 1985 with the following composition:

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    Member-Secretary

Since some of the members of the Expert Committee including the then Chairman had retired, it became necessary to reconstitute the said Expert Committee in March, 1990 with the following composition:

1. Adviser (PHEE),  
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2. Shri. S.S. Patwardhan  
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Member

10. Shri. V.B. Rama Prasad,  
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17. Shri. M.R. Parthasarathy,  
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Member

22. Shri. S. L. Abhyankar,  
Hony. Technical Adviser, 
Indian Pump & Pump Mfg. Assocn., 
Bombay.  
Member

The originally constituted Expert committee met 5 times and the reconstituted Committee held 16 meetings in all, to discuss and finalise the draft Manual. Later, in October, 1992 the Ministry had constituted a three members Editorial Committee consisting of the following members for editing and finalising the said draft document:-

1. J. D. Cruz,  
Consultant, 
WAPCOS.

2. Dr. I. C. Agarwal,  
Head of the Dptt. of Civil Engineering, 
MNREC, Allahabad.

3. Dr. D. M. Mohan,  
Director (Projects) 
HMWSS Board, Hyderabad (A.P.).

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The said Editorial committee met 3 times to complete the task assigned to it. In all there, are 26 chapters in the Manual covering various important aspects such as Planning, Legal, Financial and Administrative aspects, Design and Construction of Sewers, Sewage Treatment Plants, Sludge Treatment and Disposal, Tertiary Treatment of Sewage for Reuse, Effluent Disposal and it’s Utilisation, On-Site Sanitation, Corrosion Prevention and it’s control, Operation and Maintenance of Sewerage System as well as Treatment Plants etc. It is pertinent to mention that several modifications have been suggested in various chapters mentioned above. For instance, since conventional sewerage is very expensive it has to be confined to Class-I cities and capitals of States/UTs. Even in such cities, sewerage has to be confined to core areas only and the fringe areas have to be provided with less expensive on-site sanitation systems. Similarly, taking into account the hydraulics and other relevant factors, the design of sewers has been modified to make it economical. In so far as treatment of sewage is concerned, Anaerobic method such as USAB technology has been introduced since it is less energy intensive and economical in operation and maintenance. Similarly, duckweed ponds have been suggested for treating sewage in an economical way with impressive cash returns. Adequate emphasis has been given to reuse and recycling of sewage effluent after tertiary treatment, keeping in view the ever increasing demand for fresh water for various beneficial uses. Operation and Maintenance of Sewerage Systems and Sewage Treatment Plants is often neglected due to inadequate funds and lack of trained technical manpower. Therefore, these aspects have been given due emphasis and discussed in detail. Later, in November, 1992 the draft Manual was circulated to various State Public Health Engineering Deps. and Water Supply and Sewerage Boards with a view to have their valuable suggestions on the same before it’s finalisation and printing. Finally the contents of the Manual were thoroughly discussed in greater detail, topic by topic at a special conference of Chief Engineers in charge of Urban Water Supply and Sanitation Sector held at Thiruvananthapuram (Kerala) on 24th and 25th September, 1993 organised by the Ministry of Urban Development and Kerala Water Authority.

The said Conference was well attended and valuable suggestions that emerged during the discussions have been incorporated to the extent possible to make this Manual useful from the practising Engineer’s point of view. There are no two opinions that the said Manual will be a boon to the field Engineers in the country.

The Expert Committee thanks the Ministry of Urban Development, Govt. of India for providing all facilities. The initiative taken and sincere efforts made by Shri V. Venugopal, the then Adviser(PHEE) in getting the original Expert Committee constituted is gratefully acknowledged. The Committee expresses its appreciation to Shri V.B. Rama Prasad, Dy. Adviser (PHE) and Member-Secretary for his untiring efforts in making possible the completion of the manual in it’s finest form despite his arduous normal duties. Special mention is made of the services of Shri R. Sethuraman, Dy. Adviser (Trg.) and Shri M. Sankaranarayanan, Asst. Adviser(PHE) who unstintingly devoted their time in all phases of this work. The valuable contribution of Dr. S.R. Shulka, Dy. Adviser (PHE), Shri B. B. Uppal, Asst. Adviser (PHE) and Shri Sukanta Kar, Scientific Officer in CPHEEO are gratefully acknowledged. The committee thanks Dr. D. M. Mohan, Presently Director (Projects), Hyderabad Metropolitan Water Supply and Sewerage Board for getting the final draft computerised. Thanks are also due to the Govt. of Kerala and Kerala Water Authority for hosting the aforesaid conference.

Last but not the least, the committee desires to record their deep appreciation of the services rendered by different Officers and staff members of the PHE and Accounts Section of the Ministry and the Secretariat of CPHEEO.

P.S. RAJVANSHY
ADVISER (PHEE)
C.P.H.E.E.O.
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