

APPENDIX – A5-2

Minutes of Expert Committee Meetings

(A) Minutes of First Expert Committee Meetings

No.Q-16011/1/2007-CPHEEO
Government of India
Ministry of Urban Development
CPHEEO

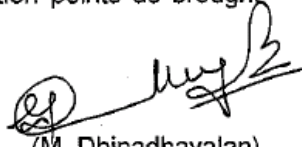
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Nirman Bhawan, New Delhi
Dated the 30th September, 2010

Sub: Minutes of the First Meeting of the Expert Committee and JICA Study Team for the Revision and Updating of the Manual on Sewerage and Sewage Treatment held under the Chairpersonship of Director (WS), Ministry of Urban Development in conference room 103, A-wing, Nirman Bhawan, New Delhi on 26th August 2010 at 10.30 A.M.- Regarding.

Please find enclosed a copy of the minutes of the 1st meeting of the Expert Committee and JICA Study Team for the Revision and updating of the Manual on Sewerage and Sewage Treatment held under the Chairpersonship of Director (WS), Ministry of Urban Development in conference room 103, A-wing, Nirman Bhawan, New Delhi on 26th August 2010 at 10.30 A.M. for information and necessary compliance.

It is requested that all the suggested action points as brought out in the minutes may kindly be complied with.

Encl: As above


(M. Dhinadhayan)
Deputy Adviser (PHE) &
Member Secretary
Tel: 011-23062418
Fax: 011-23062482

To

As per list enclosed

Copy submitted for information to:

- (i) PS to Joint Secretary (UD), Ministry of Urban Development
- (ii) PS to Director (WS), Ministry of Urban Development

/
(M. Dhinadhayan)
Deputy Adviser (PHE)

Minutes of the First Meeting of the Expert Committee and JICA Study Team and the representative of the SMEC India (Pvt.) Ltd. for the Updating and Revision of the Manual on Sewerage and Sewage Treatment held under the Chairpersonship of Director (WS) on 26TH August, 2010.

The first meeting of the Expert Committee, the JICA Study Team and the representative of SMEC India (Pvt.) Ltd. for the Updating and Revision of the Manual on Sewerage and Sewage Treatment was held under the Chairpersonship of Director (WS) in conference room 103, A-wing, Nirman Bhawan, New Delhi at 10.30 A.M., on 26th August 2010. The list of participants is appended.

At the outset, the Chairperson of the Expert Committee welcomed all the members of the Expert Committee, representatives from JICA, Experts from the JICA Study Team and the representative of SMEC India (Pvt.) Limited. While expressing her concern about the poor sanitation status in the urban areas of the country based on the recent survey conducted by the Ministry of Urban Development, the Chairperson highlighted various initiatives of the Ministry under the National Urban Sanitation Policy, October 2008. She stated that the Ministry is assisting the State Governments and Urban Local Bodies (ULBs) in preparation of State sanitation strategies and City Sanitation Plans. The Chairperson expressed concern about unsatisfactory sanitation management systems in the urban areas of the country and stressed upon efficient management including proper planning, designing, implementation of sewerage schemes using appropriate technologies and efficient operation and maintenance suitable under local conditions. She advised the Expert Committee and JICA Study Team to examine various technological options suitable under Indian conditions from techno-economic angles and suggested their inclusion in the revised Manual.

While concluding, the Chairperson expressed her best wishes to all the members of the expert committee and JICA Team for fulfilling the challenging task within the stipulated timeframe. She also assured the committee of all help and assistance from the Ministry. Due to her busy schedule, she requested Dr. Shukla, co-chairman & member of the expert committee to chair the meeting.

Shri M. Dhinadhayalan, Deputy Adviser (PHE) and Member-Secretary of the Expert Committee gave introductory remarks on the unsatisfactory sanitary conditions in urban areas of the country and stressed upon the need for revision and updating of the Manual on Sewerage and Sewage Treatment on the basis of the suggestions put forth by the Chairperson so as to cover 100 per cent population in urban areas of the country within the shortest possible timeframe. He stressed the need of revising and updating of the manual in the light of the National Urban Sanitation Policy of the Ministry and requested the expert members of the committee and JICA Study Team to complete the exercise of revising and updating of the Manual preferably within a period of 24 months keeping in view the objectives and key issues as brought out in the National Urban Sanitation Policy of the Ministry.

Dr. Shukla, Co-chairman and member of the Expert Committee, mentioned a number of key issues and suggested the following action plan for consideration of the members of the expert committee and the JICA Study Team.

- (i) City Development Plan should be prepared according to the growth pattern of the city keeping in view the long-term-plan (about 100 years), medium-term-plan (about 50 years) and short-term-plan (for about 15 to 25 years). The short-term-plan should be the sub-set of medium-term-plan and medium-term-plan should be the sub-set of long-term-plan. All these plans should be **treated as sacrosanct** and any change or revision should invariably have the approval of the Experts of various sectors as and when necessity arises.
- (ii) There should be strict policies for beneficiaries and implementing, operating and maintenance agencies. There should not be any deviation once the project is approved and under implementation as per the plan.
- (iii) Various alternative collection systems and sewage treatment facilities suiting local conditions as well as water scarcity conditions should be highlighted in the proposed manual.

- (iv) Guidelines for decentralized systems should be documented and wherever possible decentralized system should be encouraged.
- (v) In view of water scarcity, minimum per capita supply of water is recommended thereby generating less per capita wastewater flow. This necessitates reconsideration of design of wastewater collection and treatment plants from the techno-economic feasibility angle.
- (vi) Guidelines for dual-plumbing system: In view of the present trend of using treated wastewater for non-potable purposes, such as flushing of toilets, gardening etc dual-plumbing system should be considered.
- (vii) Water supply and sewerage schemes should be integrated.
- (viii) Guidelines for Recycling and Reuse of treated wastewater should be prepared.
- (ix) Degree of treatment required for treated effluent depending upon its end use should be specified.
- (x) Guidelines for PPP for planning, implementation, operation and maintenance of sewerage scheme and guidelines for PSP for O & M of such schemes should be prepared.
- (xi) Community awareness and people's participation;
- (xii) Sewerage schemes should be demand driven rather than supply driven;
- (xiii) Multiplicity of organizations dealing with sanitation sector is a major issue. Only one organization should be responsible for the sector which can be held responsible for any eventuality;

- (xiv) 'Polluters must pay' principle should be adopted and followed.

Dr. S. Sundaramoorthy, Former Engineering Director and member of the expert committee, opined that incremental sanitation would be appropriate for many cities and towns in the country by which technologies proposed at present can be upgraded as and when required in future.

Shri Teckechi, Team Leader of the JICA Study team circulated a copy of the Inception Report on 'The Study and Formulation and Revision of Manual on Sewerage and Sewage Treatment, Phase – 1', August 2010 prepared by Tokyo Engineering Consultants Co. Ltd. in association with Nihon Hets Industry Corporation, to all the committee members and made a power-point presentation regarding the brief contents of the Inception Report. The Team Leader mentioned that the JICA Study team proposed to undertake field studies in 9 States & 1 UT and study the performance of about 48 existing sewage treatment plants in order to have first hand information. For the purpose, a questionnaire has been designed by the Study Team and will be circulated to all the concerned authorities in consultation with the CPHEEO, and details will be collected during the visit of the Study Team to the respective cities and towns.

Shri Teckechi mentioned that the Study Team will analyze and come out with their recommendations on various technologies and suggest suitable measures for Revising and Updating the Manual on Sewerage and Sewage Treatment being prepared by the Experts of the Study Team. This exercise would also help in formulating the new Manual on Operation and Maintenance of Sewerage Systems. He mentioned that the Study Team will prepare the 'Interim Report' on the basis of the field visits, covering broad topics to be covered in the proposed Manual. This interim report will serve as a base document for drafting the proposed Manual. The interim report prepared by the Study Team will also be reviewed and finalized by the Expert Committee.

While making the presentation, Shri Teckechi briefly explained the following criteria for selection of sewage treatment plants in cities and towns in 9 states & 1 UT in the country;

- Variation in climatic conditions

- Size of cities and towns
- Capacity of existing sewage treatment plants (STPs)
- STPs employing conventional sewage treatment processes or any new technologies
- Number of sewage treatment plants in the state, and
- Management entity

The members of the Expert Committee suggested following for the consideration of the Study Team before they decide for the field visits;

- (i) to include some states in North-Eastern Region and hilly states
- (ii) to include some of the STPs with SBR, MBBR and MBR technologies;
- (iii) also include low cost sewerage systems and onsite sanitation management systems in small towns'
- (iv) to include sewage collection networks including house-sewer connections, man holes, pumping stations etc.

It was decided that while revising and updating the Manual, following issues need to be addressed in addition to the guidelines stipulated in the existing manual;

- The policy, objectives and goals, and key issues as brought out in the National Urban Sanitation Policy'
- Latest sewage treatment technologies available around the world and their application under Indian conditions;
- Tertiary treatment technologies;
- Approach and guidelines for separate system;
- Guidelines for urban storm water drainage may not be considered as a separate manual on urban storm drainage system is under preparation by another Expert Committee appointed by the Ministry;
- Incremental sanitation method;
- Guidelines for PPP, Social/Community Development;
- Health and safety measures that should be mandatory during construction, operation and maintenance of sewerage systems;

- Policy guidelines for quality maintenance during construction, operation and maintenance, sustainable solutions such as recycle & reuse of treated wastewater, reuse of gas and sludge etc.
- Package or compact sewage treatment plant;
- Removal of Phosphate, Nitrogen, and Nitrate in the sewage treatment plant;
- Making house-sewer connections mandatory by formulating and implementing suitable bye-laws for existing and proposed sewer networks;
- Low cost sanitation.

Dr. S. Sundaramoorthy made a power-point presentation regarding the recycling and reuse of treated wastewater and suggested that a separate chapter on Recycle & Reuse Treated Wastewater be included in the proposed Manual covering techno-economic and socio-economic feasibility aspects. He emphasized the need for promoting the use of treated wastewater in water scarcity areas as well as recharging of the ground water in coastal areas to avoid intrusion of saline water.

After detailed deliberations and discussions on the proposed manual, the Expert Committee and the JICA Study Team decided the broad outlines of the manual. It was further decided that the title of the proposed manual be retained as it is in the present form i.e. Manual on Sewerage and Sewage Treatment. The broad outlines of the proposed Manual in the form of chapters are as under;

- (i) Planning
- (ii) Management, Administration, Legal and Financial aspects
- (iii) Design and Construction of Sewers
- (iv) Design and Construction of Sewage Pumping Stations
- (v) Design and Construction of Sewage Treatment Facilities

- (vi) Design and Construction of Sludge Collection facilities
- (vii) Recycle and Reuse
- (viii) Onsite Management
- (ix) Recent (new) Trends in Sewage Treatment

It was further decided that detailed contents of each chapter of the Manual will be worked out by the JICA Study Team and the same will be forwarded to the Member Secretary who will in turn forward the same to all the members of the Expert Committee for their views and discussions in the next meeting.

It was decided in consultation with all the members of the Expert Committee that the Second meeting of the Expert Committee will be held on 27th October, 2010. The meeting notice will be circulated to all the members in due course.

The meeting ended with thanks to the Chair.

List of Participants for 1st Meeting Expert Committee and JICA Study Team for Revision and updating of the Manual on of Sewerage & Sewage Treatment

Date: 26th Aug, 2010

Venue: 103 A, CPWD Conference Room, Nirman Bhawan, New Delhi

Sr. No.	Name	Designation	Department	Contact No.
Expert Committee Members				
1.	Ms E.P. Nivedita	Director (WS) and Chairperson	MoUD	011-23061295
2.	Dr S.R. Shukla	Former Advisor(PHEE) and Co-Chairman		011-45655451
3.	Shri. B.B. Uppal	Former Deputy Advisor (PHE), CPHEEO		9810956908
4.	Dr. A.A. Kazmi	Associate Prof.	IIT, Roorkee	9837262698
5.	Shri. M.Sankaranarayanan	Dy. Advisor	CPHEEO	9810627294 narayanan_50@yahoo.com
6.	Shri. V.K. Chaurasia	Dy. Advisor	CPHEEO	9818225985
7.	Shri. D.K. Agarwal	Scientist "F"	Bureau of Indian Standard	9831647086
8.	Shri. S.T. Gopalram	Joint Chief Engineer (P&D)	TWAD Board, Chennai	9444144362
9.	Shri. C. Lallunghnema	Joint Secretary	PHED, Mizoram	9436 141 286 c.hnema@yahoo.com
10.	Shri. Nizzamuddin	Senior Environmental Engineer	Central Pollution Control Board	9411232631
11.	Dr. G.R. Pophali	Scientist	National Environment Engineering Research Institute	0712-2249885 Extn: 411 gr_pophali@neeri-res.in
12.	Shri. D.P. Singh	Chief Engineer	U.P. Jal Nigam	9473943006

				dpsjal@yahoo.co.in
13.	Dr. S. Sundaramoorthy	Retd. Engineering Director	Chennai Metropolitan Water and Sewerage Board	9444052434
14.	Dr. Vinod Tare	Professor, Dept. of Civil Engineer	IIT, Kanpur	9415130517
15.	Dr. A.K. Nema	Associate Professor, Dept. of Civil Engineer	IIT, Delhi	9810827852
16.	M. Dhinadhayalan	Dy. Advisor(PHE)	CPHEEO	9818477087
JICA Representatives				
17.	Shri. Toru KOBAYAKAWA	JICA Expert	JICA	9810323105
18.	Shri. Masatoshi YAMADA	JICA Expert	JICA	9810267913
JICA Study Team				
19.	Shri. Akira Takechi	Team Leader, JICA Study Team	JICA Study Team	9582786201
20.	Shri. Alok KUMAR	Asst Team Leader, JICA Study Team	JICA Study Team	9711470144
21.	Shri. Kiyoshi MIZUFUNE	Team Member, JICA Study Team	JICA Study Team	9582337835
22.	Shri. Gururaj Rao	Team Member, JICA Study Team	JICA Study Team	9582337836
23.	Dr. KIYOSHI MORIYAMA	Team Member, JICA Study Team	JICA Study Team	9582337837
SMEC Team				
24.	Shri. Deepak Sharma	Team Leader	SMEC (India)	9999627951
25.	Shri. Rohit Srivastava	O&M Specialist	SMEC (India)	9811549547
26.	Dr. Abhishek Saxena	Support Staff (Water Resource Specialist)	SMEC (India)	9818773215

No.Q-16011/1/2007-CPHEEO
Government of India
Ministry of Urban Development
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Nirman Bhawan, New Delhi
Dated the 30th September, 2010

Sub: Minutes of the First Meeting of the Expert Committee and JICA Study Team for the Preparation of the Manual on Operation and Maintenance of Sewerage Systems held under the Chairpersonship of Director (WS), Ministry of Urban Development in conference room 103, A-wing, Nirman Bhawan, New Delhi on 27th August 2010 at 10.30 A.M. – Regarding.

Please find enclosed a copy of the minutes of the 1st meeting of the Expert Committee and JICA Study Team for the Preparation of the Manual on Operation and Maintenance of Sewerage Systems held under the Chairpersonship of Director (WS), Ministry of Urban Development in conference room 103, A-wing, Nirman Bhawan, New Delhi on 27th August 2010 at 10.30 A.M. for information and necessary compliance.

It is requested that all the suggested action points as brought out in the minutes may kindly be complied with.

Encl: As above


(M. Dhinadhayan)
Deputy Adviser (PHE) &
Member Secretary
Tel: 011-23062418
Fax: 011-23062482

To

As per list enclosed

Copy submitted for information to:

- (i) PS to Joint Secretary (UD), Ministry of Urban Development
- (ii) PS to Director (WS), Ministry of Urban Development

/
(M. Dhinadhayan)
Deputy Adviser (PHE)

Minutes of the First Meeting of the Expert Committee and JICA Study Team and the representative of the SMEC India (Pvt.) Ltd. for the Preparation of the Manual on Operation and Maintenance of Sewerage system held under the Chairpersonship of Director (WS) on 27TH August, 2010.

The first meeting of the Expert Committee and JICA Study Team and the representative of the SMEC India (Pvt.) Ltd. for the preparation of the Manual on Operation and Maintenance of Sewerage and Sewage Treatment Plant was held under the Chairpersonship of Director (WS) in conference room 103, A-wing, Nirman Bhawan, New Delhi at 10.30 A.M., on 27th August 2010. The list of participants is appended.

At the outset, the Chairperson of the Expert Committee welcomed all the members of the Expert Committee, representatives from JICA, Experts from the JICA Study Team and the representative of SMEC India (Pvt.) Limited. While expressing her concern about the poor sanitation status in the urban areas of the country based on the recent survey conducted by the Ministry of Urban Development, the Chairperson highlighted various initiatives of the Ministry under the National Urban Sanitation Policy, October 2008. She stated that the Ministry is assisting the State Governments and Urban Local Bodies (ULBs) in preparation of State sanitation strategies and City Sanitation Plans. The Chairperson expressed concern about unsatisfactory sanitation management systems in the urban areas of the country and stressed upon efficient management including proper planning, designing, implementation of sewerage schemes using appropriate technologies and efficient operation and maintenance suitable under local conditions. She advised the Expert Committee and JICA Study Team to examine various O & M and management issues and suggested their inclusion in the proposed Manual.

While concluding, the Chairperson expressed her best wishes to all the members of the expert committee and JICA Team for fulfilling the challenging task assigned to complete the same within the stipulated timeframe. She also assured the committee for all the help and assistance from the ministry for accomplishing this challenging task. Due to her busy schedule, she requested Dr. S.R. Shukla, co-chairman & member of the expert committee to take charge for the continuance of the meeting proceedings.

Shri M. Dhinadhayalan, Deputy Adviser(PHE) and Member-Secretary of the Expert Committee gave introductory remarks on the emergent need for the formulation and preparation of the Operation and Maintenance of Sewerage and Sewage Treatment Plant in the country based on the need expressed by the Chairperson. He requested the expert members of the committee and JICA Study Team to complete the exercise of formulation and preparation of the Manual preferably within a period of 24 months. He further suggested that the expert committee give adequate cognizance to various objectives and key issues as brought out in the National Urban Sanitation Policy of the Ministry for inclusion in the proposed O & M manual.

During the meeting, copies of the following three documents were made available to the Expert Members:

1. Manual on Sewerage and Sewage Treatment, 1993, published by the Ministry of Urban Development,
2. Manual on Operation & Maintenance of Water Supply Systems, 2005, published by the Ministry of Urban Development, and
3. A Report on 'Willingness to Pay for Drinking Water Supply and Sanitation' published by the Department for International Development, Regional Water and Sanitation Group – South Asia, 1997.

Dr. S.R. Shukla mentioned a number of key issues and suggested an action plan for consideration of the members of the expert committee and JICA Study Team.

1. **Importance of 3Ms:** Dr. Shukla mentioned that 3Ms stand for **Money, Material and Man-power**. These are the legs of an O & M system on which the sustainability of any system depends including water supply and sanitation system as well. The entire system comprising of **Hardware and Software** managed by the System Manager (Management Authority) is supported by this 3Ms tripod. Normally the software is the first causality followed by the hardware in a poorly managed system. After some time, the system

becomes a liability to the management before its designed period and dies a pre-mature death. Urban water supply and sanitation systems are no exception in India.

2. **Cost Recovery:** Dr. Shukla stressed upon the need for cost recovery from the beneficiaries which is one of the very important aspects to be dealt with carefully. Studies conducted so far have concluded that in urban areas, the poorest of the poor are willing to pay about one per cent of his/her monthly income towards water supply and sanitation services provided to his/her family's satisfaction.

3. **Other Important Issues:** Dr. Shukla emphasized that few other important issues need due consideration while drafting the manual. These are; inadequate finances, poor supervision, inferior quality of materials & machinery, time and cost over-runs, poor workmanship, improper or inadequate training of personnel at all levels, poor policy decision making, poor management information system, inappropriate system design, overlapping responsibilities, inadequate policies and legal framework, inefficient and ineffective use of funds, lack of community awareness, multiplicity of agencies/departments, apathy towards PPP and PSP practices, lack of accountability and poor inventory system.

Shri Teckechi, Team Leader of the JICA Study team circulated a copy of the Inception Report on 'The Study and Formulation and Revision of Manual on Sewerage and Sewage Treatment, Phase – 1', August 2010 prepared by Tokyo Engineering Consultants Co. Ltd. in association with Nihon Hets Industry Corporation, to all the committee members and made a power-point presentation regarding the brief contents of the Inception Report. The Team Leader mentioned during presentation that JICA Study team proposed to undertake field studies in 9 States & 1 UT in India and collect and compile information on various issues and study the performance of about 48 existing sewage treatment plants in cities and towns of 9 states & 1 UT in the country in order to have first hand information. For the purpose, a questionnaire has been designed by the Study Team and will be circulated to all the concerned authorities in consultation with the C.P.H.E.E.O., and details will be collected during the visit of the Study Team to the respective cities and towns.

Shri Teckechi mentioned that the Study Team will analyze and come out with their recommendations on various technologies and suggest suitable measures for the proposed Operation and Maintenance Manual being prepared by the Experts of the Study Team. He mentioned that the Study Team will prepare the 'Interim Report' on the basis of the field visits, covering broad topics to be covered in the proposed Manual. This interim report will serve as a base document for drafting the proposed Manual. The interim report prepared by the Study Team will also be reviewed and finalized by the Expert Committee.

While making the presentation, Shri Teckechi briefly explained the following criteria for selection of sewage treatment plants in cities and towns in 9 states & 1 UT in the country;

- Variation in climatic conditions
- Size of cities and towns
- Capacity of existing sewage treatment plants (STPs)
- STPs employing conventional sewage treatment processes or any new technologies
- Numbers of sewage treatment plants in the state, and
- Management entity

The members of the Expert Committee suggested following for the consideration of the Study Team before they decide about the field visits;

- (i) to include some states in North-Eastern Region and hilly states
- (ii) inclusion of low cost sewerage systems and onsite sanitation management systems in small towns'
- (iii) to include sewage collection networks including house-sewer connections, man holes, pumping stations etc.

Shri Elangovan, Engineering Director, CMWSSB and Expert Member mentioned that health and safety measures are also very important aspects to be included in the manual. He mentioned that various tools and plants including sewer cleaning machines used for operation and

maintenance of sewerage systems need to be suitably addressed in the manual depending upon the scope and size of the system.

Dr. S. Sundaramoorthy, Former Engineering Director, CMWSSB and Expert member of the Committee stressed upon the need for proper training of the personnel involved in the operation and maintenance of sewerage system.

While highlighting various Operation and Maintenance issues, Dr. S. Sundaramoorthy suggested that the manual can consist of three volumes, namely;

1. Engineering,
2. Operation and Maintenance, and
3. Management.

Dr. Sundaramoorthy mentioned that the broad chapters which were finalized by the Expert Committee for the revision and Updating of the Manual on Sewerage and Sewage Treatment on 26th August, 2010 will be covered under the volume 'Engineering'.

After having detailed deliberations and discussions of the proposed manual, the

Expert Committee and the JICA Study Team decided the following broad chapters under the volumes of "Operation & Maintenance" and "Management"

Operation and Maintenance

- Introduction
(Existing scenario, Objectives of this Manual, Legal Frameworks)
- Strategy
- Gravity Collection Systems
- Pumping Stations and Pumping Mains

- Pretreatment
- Primary Treatment
- Secondary Treatment
- Disinfection
- Tertiary Treatment
- Sludge Treatment
- Treatments for Reuse
- Resource Recovery
(Gas, Treated Effluent and Sludge)
- Onsite Systems
- Human Resources
- Quality Monitoring and Control
(Wastewater, sludge, Operation Record)
- Instrumentation and Automation
- Electrical and Mechanical Equipments (Energy auditing)
- Health and Safety

Management

- Management Information System (MIS)
- Institutional Development
- Financial Management
(Billing and Collection)
- Customer Relation
- Community Participation
- PPP and PSP
- Regulatory Framework

It was further decided that detailed contents of each chapter of the Manual will be worked out by the JICA Study Team and the same will be forwarded to the Member Secretary who will in turn forward the same to all the members of the Expert Committee for their views and discussions in the next meeting.

It was decided in consultation with all the members of the Expert Committee that the Second Meeting of the Expert Committee will be held on 28th October, 2010. The meeting notice will be circulated to all the members in due course.

The meeting ended with thanks to the Chair.

List of Participants in the 1st Meeting of the Expert Committee for the preparation of the Manual on O&M of Sewerage Systems

Date: 27th Aug, 2010

Venue: 103 A, CPWD Conference Room, Nirman Bhawan, New Delhi

Sr. No.	Name	Designation	Department	Contact No.
Expert Committee Members				
1.	Mrs E.P. Nivedita	Director (WS) & Chairperson	MoUD	-
2.	Dr S.R. Shukla	Former Advisor, CPHEEO, MoUD		011-45655451
3.	Shri S.V. Ahuja	Project Director	Gujrat Water Supply & Sewerage Board	9978440653
4.	Shri Sumit Datta	Chief Engineer, SD & SWM Sector	Karnataka Municipal Development Authority	9433773575 datta.sumit50@gmail.com
5.	Shri M. Satyanarayanan	Director Projects	Hyderabad Municipal Water Supply & Sewerage Board	9032000601
6.	Shri S.M. Jejurikar	Chief Engineer	Municipal Corporation, Great Mumbai	9820547663 smjejurikar@indiatimes.com
7.	Shri J.S. Bahra	Executive Engineer	Punjab Water Supply & Sewerage Board, Chandigarh	9646 700 133 bahrapwssb@gmail.com
8.	Shri Dilip Kumar Padhi	Chief Engineer, Member Secretary	Orissa Water Supply & Sewerage Board,	9337103400
9.	Dr. A.A. Kazmi	Associate Prof.	IIT, Roorkee	9837262698
10.	Shri J.P. Mani	Project Manager	U.P. Jal Nigam, Allahabad	9473942674
11.	Shri J.B. Ravindar	Assistant Advisor (PHE)	CPHEEO, MoUD	011- 23061043

12.	Shri M. Sankaranarayanan	Deputy Advisor (PHE)	CPHEEO, MoUD	9810627294
13.	Dr. S. Sundaramoorthy	Former Engineering Director	Chennai Metropolitan Water and Sewerage Board	9444052434
14.	G. Elangovan	Engineering Director	Chennai Metropolitan Water and Sewerage Board	7845055533
15.	Shri M. Dhinadhayalan	Deputy Advisor(PHE)	CPHEEO, MoUD	9818477087
JICA Representatives				
16.	Shri Toru KOBAYAKAWA	JICA Expert	JICA	9810323105
17.	Shri Masatoshi YAMADA	JICA Expert	JICA	9810267913
18.	Shri Mihir Sorti	Senior Development Specialist	JICA	011- 47685500
JICA Study Team				
19.	Shri Alok KUMAR	Asst Team Leader	JICA Study Team	9711470144
20.	Shri Kiyoshi MIZUFUNE	Team Member	JICA Study Team	9582337835
21.	Shri Gururaj Rao	Team Member	JICA Study Team	9582337836
22.	Dr. KIYOSHI MORIYAMA	Team Member	JICA Study Team	9582337837
23.	Shri Akira Takechi	Team Leader	JICA Study Team	9582786201
SMEC Team				
24.	Shri Deepak Sharma	Team Leader	SMEC (India)	9999627951
25.	Shri Rohit Srivastava	O&M Specialist	SMEC (India)	9811549547
26.	Dr. Abhishek Saxena	Support Staff (Water Resource Specialist)	SMEC (India)	9818773215

(B) Minutes of Second Expert Committee Meetings

Minutes of the Second Meeting of the Expert Committee and JICA Study Team on the Updation and Revision of the Manual on Sewerage and Sewage Treatment held at Nirman Bhawan on 27th October, 2010 at 10:30AM.

The second meeting of the Expert Committee, the JICA Study Team and the representatives of SMEC India (Pvt.) Ltd. for the Up-dating and Revision of the Manual on Sewerage and Sewage Treatment (Part - A) was held on 27th October 2010 at 10.30 AM in conference room no. 103, A-Wing, Nirman Bhawan, New Delhi. Since the Chairperson Ms. E. P. Nivedita, Director (WS) was pre-occupied, she could not chair the Expert Committee meeting. Dr. S. R. Shukla, Member and Co-Chairman of the Expert Committee, chaired the meeting. The list of participants is appended.

At the outset, the Chairman welcomed the members of the Expert Committee, experts from JICA Study Team and the representatives of SMEC India (Pvt.) Ltd. The Chairman requested for an introduction of all the Expert Committee Members before start of the session.

After the introduction, Dr. Shukla requested JICA Study Team members to make a power point presentation on the findings of the 1st round of field visits study conducted during Aug. - Sept. 2010 and to present the Draft Table of Contents of the Manual (Part - A) which had been prepared by the JICA Study Team.

Dr. Alok Kumar, JICA Study Team made a power point presentation on the findings of their field visits. Mr. Takechi informed that his Team focused on Operations & Maintenance carried out at STPs. He informed that the following STPs were visited by the JICA Study Team during first field visit.

Sl. No.	Location	Sl. No.	Location
1.	Coronation Pillar Phase I (45.5 MLD TF)	8.	NOIDA Sector 50B (34 MLD, UASB+PP), U.P.
2.	Rithala (181.9 MLD ASP + HR Bio-filter), Delhi	9.	Peela Khar (10 MLD, WSP), Mumbai
3.	Okhala STP (205MLD, ASP), Delhi	10.	Vashi Plant (100 MLD, SBR), Mumbai
4.	Delhi Int'l. Airport (15 MLD, Bio N-DN-RO), Delhi	11.	Ghatkopar Plant (300 MLD, AL), Mumbai
5.	Karnal (40MLD, UASB+PP), Haryana	12.	Bandra (1500, Marine Outfall), Mumbai
6.	Gurgaon Sewerage (69 MLD, ASP), Haryana	13.	Badalpur On-Site Sanitation
7.	Hindon (73MLD, UASB+PP+Agro Forestry), Ghaziabad, U.P.	14.	Pune MBR (40 MLD), Pune

The Chairman requested all the expert committee members to discuss and finalize the Draft Table of Contents of Manual on Sewerage and Sewage Treatment formulated by JICA Study Team.

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at Nirman Bhawan on 27TH October, 2010 at 10:30AM.

Dr. Kumar presented brief about the O & M condition of various STPs of first round of site visits. Of all the STPs visited, JICA Study Team observed that Delhi International Airport STP had better environmental conditions amongst other STPs, as it is relatively new (though the plant was not fully commissioned). Similarly Nerul STP (100MLD) was working in good condition and overall the operational condition of STP was satisfactory.

A grading system for evaluation of performance of operation and maintenance of STPs was adopted by the JICA Study Team as per observations made during site visits and the data collected. The grading system of STPs for different level of performance as excellent, very good, good, poor and very poor was developed from field study. The various grading systems adopted are mentioned below:

Level 1	Very Poor - No data available or no data handed over to JICA Study Team
Level 2	Poor - Data available but not reliable
Level 3	Good - Normal, not very bad
Level 4	Very Good – All data available, good O&M data and water quality data available
Level 5	Excellent – All data, O&M data available and STP running well

Dr. Kumar was requested to explain the basis for categorization of various STPs by the Expert Committee Members. Dr. Sundaramoorthy, Member of the Expert Committee, expressed his concern on the grading system adopted by the JICA Study Team for STPs visited by them. He suggested that the Study Team shall give more constructive comments and observations instead of giving poor opinion about the performance of the STPs which might give leverage to a person or persons to legalize the opportunity issues in vested interest. The Study Team shall suggest some corrective measures to be adopted by the concerned agencies and for better operation and maintenance of the plants.

After a fruitful discussions, the Draft Table of Contents (Part A) was finalized by the Expert Committee Members. Each Chapter and Section was discussed in detail. The highlighted portions which kept in the Table of Contents are the part of the existing Manual which needs to be studied further by the JICA Study Team so as to make the manual more informative as compared to the earlier Manual which is under revision. The Draft Table of Contents was finalized as below.

Minutes of the Second Meeting of the Expert Committee and JICA Study Team on the Update and Revision of the Manual on Sewerage and Sewage Treatment held at Nirman Bhawan on 27th October, 2010 at 10:30AM.

DRAFT TABLE OF CONTENTS

SEWERAGE AND SEWAGE TREATMENT (PART- A)

CHAPTER 1	INTRODUCTION
1.1	Preamble
1.2	Overview
1.3	Objective (include both sewerage and onsite part)
CHAPTER 2	PLANNING
2.1.	Basic Consideration (need for planning)
2.2.	Survey
2.3.	Planning of Sewage Treatment
2.4.	Planning of Sludge Treatment
2.5.	Planning of Facilities
2.6.	Planning of Utilization of Resources and Space
2.7.	Planning Reconstruction
2.8.	Considerations for Planning of Regional Sewerage System
2.9.	Master Plan of Small Scale Sewerage
2.10.	Environmental Preservation
2.11.	Design Criteria
2.12.	Engineering Reports and Facility Plans
2.13.	Engineering Plans and Specifications
CHAPTER 3	MANAGEMENT, ADMINISTRATION, LEGAL AND FINANCIAL ASPECTS
3.1.	Management
3.2.	Common Aspects of Management
3.3.	Other Aspects of Management
3.4.	Legal Aspects
3.5.	Financial Aspects
CHAPTER 4	DESIGN AND CONSTRUCTION OF SEWERS
4.1.	General
4.2.	Types of Collection System (including vacuum also)
4.3.	Types and Materials of Sewers
4.4.	Hydraulics (Design Capacity and Design Flow, Depth of Sewers, etc.)
4.5.	Design Considerations for Sewer System
4.6.	Design of Sewer systems (Old manual Chapter 3, Chapter 4, Chapter 5, Chapter 6, Chapter 7, plus present additions, Decentralized system)

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- 4.7. Protection and Bed of Sewer
 - 4.8. Connection and Joint of Sewer
 - 4.9. Type and Cross Section of Open Conduit
 - 4.10. House Inlet and Connection
 - 4.11. House Connections
 - 4.12. Manholes
 - 4.13. Inverted Siphons
 - 4.14. Protection of Water Supplies
 - 4.15. Sewer Reconstruction/Rehabilitation
- CHAPTER 5 DESIGN AND CONSTRUCTION OF SEWAGE PUMPING STATIONS
- 5.1. General
 - 5.2. Design (Chapter 9) plus latest additions
 - 5.3. Suction-Lift Pump Stations – Special Considerations (Types and Specifications of Suction Pumps)
 - 5.4. Submersible Pump Stations – Special Considerations (Types and Specifications of Submersible Pumps)
 - 5.5. Screw Pump Stations – Special Considerations (Types and Specifications of Screw Pumps)
 - 5.6. Alarm Systems
 - 5.7. Instrumentation and Equipment (Valves, Flow Measurement (Old Manual Chapter 25 plus latest))
 - 5.8. Force Mains
 - 5.9. Pressure Sewer System
 - 5.10. Reconstruction/Rehabilitation of Pumping Station
- CHAPTER 6 DESIGN (AND CONSTRUCTION) OF SEWAGE TREATMENT FACILITIES
- 6.1. General
 - 6.2. Fundamental Principle of Biological Treatment
 - 6.3. Selection of Sewage Treatment Process
 - 6.4. Plant Location
 - 6.5. Quality of Effluent
 - 6.6. Design (Old Manual Chapter 10, Chapter 11, Chapter 12, Chapter 13, Chapter 14, Chapter 15, Chapter 16, Chapter 26, Suitable for decentralized sewerage, plus additions)
 - 6.7. Plant Details

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- 6.8. Plant Outfalls
- 6.9. Essential Facilities
- 6.10. Control Facilities
- 6.11. Safety
- 6.12. Laboratory
- 6.13. Screening, Grit Removal and Flow Equalization
- 6.14. Settling
- 6.15. Sewage Treatment
- 6.16. Disinfection Facility
- 6.17. Electrical and Instrumentation Facility
- 6.18. Reconstruction/Rehabilitation of Sewage Treatment Facilities
- CHAPTER 7 DESIGN AND CONSTRUCTION OF SLUDGE TREATMENT FACILITIES
 - 7.1. General
 - 7.2. Process Selection (Old Manual Chapter 17, Chapter 18, plus additions)
 - 7.3. Sludge Drying Bed
 - 7.4. Sludge Thickener
 - 7.5. Anaerobic Sludge Digestion
 - 7.6. Aerobic Sludge Digestion
 - 7.7. Sludge Pumps and Piping
 - 7.8. Sludge Dewatering
 - 7.9. Sludge Storage and Disposal
 - 7.10. Reconstruction/Rehabilitation of Sludge Facilities
 - 7.11. Bio-methanation and Energy Recovery (Carbon Credit)
- CHAPTER 8 RECYCLING AND REUSE
 - 8.1. Treated Water Reclamation and Reuse Facilities (Old Manual Chapter 19, Chapter 20, plus addition)
- CHAPTER 9 ONSITE MANAGEMENT
 - 9.1. Background
 - 9.2. Septic Tank
 - 9.3. Pour Flush Water Seal Latrines
 - 9.4. An Overview of Other Alternative Onsite Sanitation
 - 9.5. Night Soil Digesters
 - 9.6. Mini Package Treatment Plants
 - 9.7. Management of New Onsite Sanitation

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CHAPTER 10 NEWER TRENDS

- 10.1. Supplemental Treatment Processes
- 10.2. Disinfection (Problems related to use of chlorine and alternative option)
- 10.3. Supplemental Sewers

CHAPTER 11 ENVIRONMENTAL IMPACT ASSESSMENT AND RISK ASSESSMENT

The expert committee stressed upon following topics which are important and need to be more elaborate and comprehensive to be included in the proposed Manual so as to make it more useful.

1. Financial Management,
2. Human Resources Development, and
3. Public-Private-Partnership and Private-Sector-Participation

The expert committee decided that some experts in the field of the financial management of sewerage system will be inducted in the committee for reviewing the chapters on financial management.

It was decided with the consent of the Expert Members in the meeting that **the third meeting of the Expert Committee will be held on 19th January 2011**. The JICA Study Team will make a power point presentation on the draft base document based on the JICA Study Team field visits findings in Allahabad, Bangalore and Chennai. The JICA Study Team shall also make a PPT on the Table of Contents including the Sections, Sub-Sections of the Manual on Sewerage and Sewage Treatment in details.

The meeting ended with a vote of thanks by Shri M. Dhinadhayan to the Chairman, members of the expert committee, JICA Study Team and representatives of SMEC India Pvt. Ltd. Gurgaon.

Minutes of the Second Meeting of the Expert Committee and JICA Study Team on the
 Updation and Revision of the Manual on Sewerage and Sewage Treatment held
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Appendix

List of Participants				
Sr. No.	Name	Designation	Department	Contact No.
Expert Committee Members				
1	Dr. S.R. Shukla	Member & Co-Chairman	Former Adviser (PHEE), CPHEEO Min. of U. D.	011-4565 5451
2	Dr. A.A. Kazmi	Associate Professor	IIT, Roorkee	9837 262 698
3	Mr. S.T. Gopalram	Joint Chief Engineer (P&D)	TWAD Board, Chennai	9444 144 362
4	Mr. C. Lallunghnema	Joint Secretary	PHED, Mizoram	9436 141 286
5	Mr. G.R. Pophali	Scientist	NEERI, Nagpur	0712-2249 885
6	Dr. S. Sundaramoorthy	Former Engineering Director	CMWSSB, Chennai	9444 052 434
7	Dr. Vinod Tare	Professor, Dept. of Civil Engineer	IIT, Kanpur	9415 130 517
8	Dr. R.K. Singh	Asst. Chief (Projects)	HUDCO	9958 892 925
9	Dr. Hemant Langde	Chief Engineer	Mahashtra Jeevan Pradhikaran, Thane	9970 057 648
10	Mr. S. Arun Kumar	Scientist – C	BIS, New Delhi	011- 2323 01 31
11	Mr. V.K. Chaurasia	Deputy Advisor	CHPEEO	011- 2306 11 44
12	Mr. M. Dhinadhayalan	Member Secretary	CPHEEO	011-2306 1571
13	Dr. Ramakant	Assistant Adviser (Special invitee)	CPHEEO	011-2306 2482
JICA Representatives				
14	Mr. Toru Kobayakawa	JICA Expert	JICA	9810 323 105
15	Mr. Masatoshi Yamada	JICA Expert	JICA	9810 267 913
16	Mr. Mihir Sorti	Senior Development Specialist	JICA	9810 267 913
JICA Study Team Members				
17	Mr. Akira Takechi	Team Leader	JICA Study Team	9582 786 201
18	Dr. Alok Kumar	Asst. Team Leader	JICA Study Team	9711 470 144
19	Mr. Kiyoshi Mizufune	Team Member	JICA Study Team	9582 337 835
20	Mr. Gururaj Rao	Team Member	JICA Study Team	9582 337 836
21	Dr. Kiyoshi Moriyama	Team Member	JICA Study Team	9582 337 837
22	Mr. Masaaki Mukaide	Team Member	JICA Study Team	-
23	Mr. Takenori Snoryuji	Team Member	JICA Study Team	8860 218 134
24	Mr. Rajesh Chandra	Team Member	JICA Study Team	9582 028 846
25	Mr. Takehiro Nakano	Team Member	JICA Study Team	8860 218 135
26	Mr. Gyan Sagar	Team Member	JICA Study Team	0120-2579 039
27	Mr. Jay Kant Singh	Team Member	JICA Study Team	9873 583 586
SMEC Team				
28	Mr. Deepak Sharma	Team Leader	SMEC (India)	9999 627 951
29	Mr. Rohit Srivastava	O&M Specialist	SMEC (India)	9811 549 547
30	Dr. Abhishek Saxena	Support Staff (WR) Specialist)	SMEC (India)	9818 773 215

Minutes of the Second Meeting of the Expert Committee and JICA Study Team for the Preparation of the Manual on Operation and Maintenance of Sewerage Systems held at Hotel Ramada, New Delhi on 28th October, 2010 at 10.30 AM.

The second meeting of the Expert Committee and the JICA Study Team for the preparation of the Manual on Operation and Maintenance of Sewerage Systems was held on 28th October 2010 at 10.30 AM in the conference room (Saffron), Hotel Ramada Plaza, New Delhi. Since the Chairperson Ms. E. P. Nivedita, Director (WS) was pre-occupied, she could not chair the Expert Committee meeting. Dr. S. R. Shukla, Member and Co-Chairman of the Expert Committee, chaired the meeting. The list of participants is appended.

At the outset, the Chairman welcomed the members of the Expert Committee, experts from JICA Study Team and the representatives of SMEC India (Pvt.) Ltd. The Chairman requested for an introduction of all the Expert Committee Members before start of the session.

After the introduction, Dr. Shukla requested members of the JICA Study Team to make a power point presentation on the findings of the first round of field visits study conducted during Aug. - Sept. 2010 and to present the Draft Table of Contents of the Manual (Part - B) which had been prepared by the JICA Study Team.

Dr. Alok Kumar, JICA Study Team made a power point presentation on the findings of their field visits. Mr. Takechi informed that his Team focused on Operations & Maintenance carried out at STPs. He informed that the following STPs were visited by the JICA Study Team during first field visit.

Sl. No.	Location	Sl. No.	Location
1.	Coronation Pillar Phase I (45.5 MLD TF)	8.	NOIDA Sector 50B (34 MLD, UASB+PP), U.P.
2.	Rithala (181.9 MLD ASP + HR Bio-filter), Delhi	9.	Peela Khar (10 MLD, WSP), Mumbai
3.	Okhala STP (205MLD, ASP), Delhi	10.	Vashi Plant (100 MLD, SBR), Mumbai
4.	Delhi Intl. Airport (15 MLD, Bio N-DN-RO), Delhi	11.	Ghatkopar Plant (300 MLD, AL), Mumbai
5.	Karnal (40MLD, UASB+PP), Haryana	12.	Bandra (1500, Marine Outfall), Mumbai
6.	Gurgaon Sewerage (69 MLD, ASP), Haryana	13.	Badalpur On-Site Sanitation
7.	Hindon (73MLD, UASB+PP+Agro Forestry), Ghaziabad, U.P.	14.	Pune MBR (40 MLD), Pune

The Chairman and expert members desired to discuss the Draft Table of Contents (Part - B) at full length. The Chairman requested all the expert committee members to discuss and finalize the Draft Table of Contents of manual on operation and maintenance of sewerage

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system formulated by JICA Study Team.

Dr. Kumar presented brief about the O & M condition of various STPs of first round of site visits. Of all the STPs visited, JICA Study Team observed that Delhi International Airport STP had better environmental conditions amongst other STPs, as it is relatively new (though the plant was not fully commissioned). Similarly Nerul STP (100MLD) was working in good condition and overall the operational condition of STP was satisfactory.

A grading system for evaluation of performance of operation and maintenance of STPs was adopted by the JICA Study Team as per observations made during site visits and the data collected. The grading system of STPs for different level of performance as excellent, very good, good, poor and very poor was developed from field study. Various grading systems adopted are mentioned below:

Level 1	Very Poor - No data available or no data handed over to JICA Study Team
Level 2	Poor - Data available but not reliable
Level 3	Good - Normal, not very bad
Level 4	Very Good – All data available, good O&M data and water quality data available
Level 5	Excellent – All data, O&M data available and STP running well

Dr. Kumar was requested to explain the basis for categorization of various STPs by the Expert Committee Members. Dr. Sundaramoorthy, Member of the Expert Committee, expressed his concern on the grading system adopted by the JICA Study Team for STPs visited by them. He suggested that the Study Team shall give more constructive comments and observations instead of giving poor opinion about the performance of the STPs which might give leverage to a person or persons to legalize the opportunity issues in vested interest. The Study Team shall suggest some corrective measures to be adopted by the concerned agencies to improve and for better operation and maintenance of the plants.

Mr. Akira Takechi, Team Leader JICA Study Team agreed to the suggestions made by Dr. Sundaramoorthy and stated that he will modify comments on the performance of the system / STPs. Mr. M. Dheenadhayalan, Member Secretary, Expert Committee suggested to

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the JICA Study Team to reduce the number of site visits so as to collect data / information not only on STPs and but also to collect and concentrate on the entire sewerage system including sewer networks etc. so that the Team may study the complete sewerage system, its related issues, such as techno-economical, financial, manpower management, deficiency in capacity building etc.

Mr. Takechi, gave a short presentation on controlling factors for aeration plant. He made a comparison of the contents of manual prepared by Govt. of India and Govt. of Japan. Mr. Mani and Prof. Kazmi of the views that the local conditions in India and Japan are different and therefore the background of the manual under up-dating and revision must be based on the conditions prevailing in India. Mr. Takechi agreed on the suggestions and assured that during drafting of the manual these suggestions will be duly taken care of. Mr. Takechi gave a power point presentation on Conceptual Explanation of determination of Optimal Range of all the parameters related with sewage treatment.

After detailed discussions, the JICA Study Team agreed to study the complete sewerage system including various collection systems, sewage treatment facilities suiting local conditions, existing sewerage and onsite sanitation systems, management & O & M issues, financial constraints with respect to capital investment & O & M, availability of manpower, level of public awareness, O & M expenditure and cost recovery of sewerage system, billing & revenue collection, future plan of action, etc.

It was decided in the Expert Committee meeting that the JICA Study Team may visit Allahabad, Bangalore and Chennai to assess the present condition of sewerage system. JICA Study Team agreed and made their schedule accordingly to visit Allahabad (2-4 November 2010), Bangaluru (8-10 November 2010) and Chennai (11-13 November 2010).

After a fruitful discussion, the Draft Table of Contents (Part B) was finalized by the Expert Committee Members. Each Chapter and Sections were discussed at length before finalization. The highlighted portions which kept in the Table of Contents are the part of the present Manual on Sewerage and Sewage Treatment which under up-dating and revision and needed to be studied further by the JICA Study Team and to include relevant sections of the different chapters. The Draft Table of Contents is placed below.

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Draft Table of Contents

Operation and Maintenance of Sewerage System (Part-B)

CHAPTER 1	GENERAL
1.1.	Introduction
1.2.	Basic Considerations
1.3.	Outline of Operation and Maintenance
1.4.	Organization for Operation and Maintenance
1.5.	Public Awareness
1.6.	Disaster Management
1.7.	Sewerage Ledger (Overall)
CHAPTER 2	SEWER SYSTEMS (Consider Chapter 8 of old Manual)
2.1.	Introduction
2.2.	Inspection and Survey
2.3.	Sewer Cleaning
2.4.	Sewer Rehabilitation (Material, Methodology, Equipment, Long Term and Short Term)
2.5.	Protection of Sewer Systems
2.6.	Safety Practices
2.7.	Protection Against Infiltration and Ex-filtration
2.8.	Manholes and Appurtenances
2.9.	House Service Connection
2.10.	Troubleshooting
CHAPTER 3	PUMPING STATIONS
3.1.	Introduction
3.2.	Types and Structure of Pumping Stations
3.3.	Gate and Valves
3.4.	Screen
3.5.	Grit Chamber
3.6.	Grit Removal Equipment
3.7.	Wet Well
3.8.	Pump Equipment
3.9.	Flow Measuring Devices
3.10.	Preventive Maintenance (including Civil, DOs and DONTs)

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- 3.11. Safety Practices
- 3.12. Troubleshooting
- CHAPTER 4 SEWAGE TREATMENT FACILITIES (Technologies same as in Design Manual)
- 4.1. Introduction
- 4.2. Pump Equipment (Refer to Chapter 3)
- 4.3. Fine Screen and Grit Chamber
- 4.4. Oil and Grease Removal
- 4.5. Equalization
- 4.6. Primary Treatment
- 4.7. Activated Sludge Process (ASP)
 - 4.7.1 Activated Sludge Process – Conventional and Extended Aeration (ASP-Ext. Aer.)
 - 4.7.2 Activated Sludge Process – Extended Aeration, Chemical Aided Flocculation and Tertiary Sedimentation (ASP-Ext. Aer.-Ter.Sed.)
 - 4.7.3 High Rate Activated Sludge Process
 - 4.7.4 Sequential Batch Reactor (SBR)
- 4.8. Aerated Lagoon
- 4.9. Oxidation Ditch
- 4.10. Fluidized Bioreactors (Refer Metcalf & Eddy)
 - 4.10.1 Moving Biobed Reactor
- 4.11. Biotower
 - 4.11.1 Tricking Filter
 - 4.11.2 Synthetic Media Filter
- 4.12. Membrane Bioreactor
- 4.13. Upflow Anaerobic Sludge Blanket Reactor (UASB) including Post Treatment (DHS, FPU, Duckweed Pond)
- 4.14. Waste Stabilization Pond (including Aerobic, Anaerobic, Facultative and Maturation pond)
- 4.15. Farm Forestry
- 4.16. Aeration Equipments
 - 4.16.1 Blower
 - 4.16.2 Aerators
 - 4.16.3 Actuator

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- 4.17. Fish Pond
- 4.18. Integrated Nutrient Removal
- 4.19. Disinfection Facility
- 4.20. Advanced Treatment (PSF-Pressure Sand Filter, DMF-Dual Media Filter, UF, RO)
- 4.21. Preventive Maintenance (including Civil, DO's and DON'Ts)
- 4.22. Safety Practices
- 4.23. Troubleshooting
- CHAPTER 5 SLUDGE TREATMENT FACILITIES
 - 5.1. Introduction (General Management of Sludge Treatment Facilities)
 - 5.2. Sludge Thickening
 - 5.3. Aerobic Digestion
 - 5.4. Anaerobic Digestion (Gas collection, Power generation, etc.)
 - 5.5. Sludge Dehydrator
 - 5.6. Sludge Drying Bed
 - 5.7. Preventive Maintenance (including Civil, DO's and DON'Ts)
 - 5.8. Safety Practices
 - 5.9. Troubleshooting
- CHAPTER 6 ELECTRICAL AND INSTRUMENTATION FACILITIES
 - 6.1. Introduction
 - 6.2. Power Supply Facilities and (including Dual Fuel Engine,)
 - 6.3. Standby Power Supply (Generator)
 - 6.4. Prime Movers (Motor and Drives)
 - 6.5. Instrumentation Facility (including Automation)
 - 6.6. Energy Audit (refer Water Supply O&M Manual)
 - 6.7. Record of Operation and Maintenance and Its Utilization
 - 6.8. Preventive Maintenance (including Civil, DO's and DON'Ts)
 - 6.9. Safety Practices
 - 6.10. Troubleshooting
- CHAPTER 7 QUALITATIVE ANALYSIS
 - 7.1. Introduction
 - 7.2. Sampling
 - 7.3. Relevance of Parameters (Contents of Analysis Parameters)

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- 7.4. Analysis Parameters and Frequency
- 7.5. Alternative Methods (Spot tests, Transparency, etc.)
- 7.6. Data Analysis (Accuracy and Precision)
- CHAPTER 8 ENVIRONMENTAL CONSERVATION
 - 8.1. Introduction
 - 8.2. Measures against Odor
 - 8.3. Measures against Air Pollution (Bio-aerosols)
 - 8.4. Measures against Noise and Vibration
 - 8.5. Measures against Soil Contamination and Groundwater Pollution
 - 8.6. Measures against Natural Calamities (Earthquake, Flood, etc.)
 - 8.7. Regulation of Global Warming Gas
 - 8.8. Plant Beautification and Landscaping
- CHAPTER 9 SAFETY AND HEALTH MANAGEMENT
 - 9.1. Introduction
 - 9.2. Safety Organization
 - 9.3. Management Method
 - 9.4. Workers' Welfare, Safety and Health Measures
- CHAPTER 10 ONSITE SANITATION SYSTEMS
- CHAPTER 11 BUDGET ESTIMATES FOR OPERATION AND MAINTENANCE

The expert committee stressed upon following topics which are important and needed to be more elaborate and comprehensive to be carefully drafted and included in the proposed Manual so as to make it more useful.

1. Financial Management,
2. Human Resources Development, and
3. Public-Private-Partnership and Private-Sector-Participation

The Expert Committee was of the opinion that above subjects are specialized and therefore few expert members on these subjects may be inducted in the Expert Committee for drafting chapter on these special topics. It was agreed that Member-Secretary may initiate necessary action with the Ministry to get the approval for nominating and inducting few more Expert Members on the above subjects.

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It was decided with the consent of the Expert Members in the meeting that **the third meeting of the Expert Committee will be held on 20th January 2011**. The JICA Study Team will make a power point presentation on the draft base document based on the JICA Study Team field visits findings in Allahabad, Bangalore and Chennai. The JICA Study Team shall also make a PPT on the Table of Contents including the Sections, Sub-Sections of the Manual on Operations and Maintenance of Sewerage Systems.

The meeting ended with a vote of thanks by Shri M. Dhinadhayan to the Chairman, members of the expert committee, JICA Study Team and representatives of SMEC India Pvt. Ltd. Gurgaon.

Minutes of the Second Meeting of the Expert Committee and JICA Study Team for the Preparation of the Manual on Operation and Maintenance of Sewerage Systems held at Hotel Ramada, New Delhi on 28th October, 2010 at 10.30 AM.

Appendix

List of Participants				
Sr. No.	Name	Designation	Department	Contact No.
Expert Committee Members				
1	Dr S.R. Shukla	Member, Co-Chairman	Former Adviser (PHEE), CPHEEO Min. of U. D.	011-4565 5491
2	Mr. Sumit Datta	Chief Engineer, SD & SWM Sector	Karnataka Municipal Development Auth.	9433 773 575
3	Mr. S.M. Jejurikar	Chief Engineer	Municipal Corporation, Greater Mumbai	9820 547 663
4	Mr. Dilip Kumar Padhi	Chief Engineer, Member Secretary	Orissa Water Supply & Sewerage Board,	9337 103 400
5	Dr. A.A. Kazmi	Associate Prof.	IIT, Roorkee	9837 262 698
6	Mr. J.P. Mani	Project Manager	U.P. Jal Nigam, Allahabad	9473 942 674
7	Dr. S. Sundaramoorthy	Former Engig. Director	CMWSSB, Chennai	9444 052 434
8	Mr. G. Elangovan	Engineering Director	CMWSSB, Chennai	7845 055 533
9	Mr. M. Rangadhamaiah	Superintending Engineer	KUWS&DB, Bangalore	9480 813 108
10	Mr. M. DhInadhayalan	Member Secretary	CPHEEO	011-23061571
11	Dr. Ramakant	Assistant Adviser (Special invitee)	CPHEEO	011-2306 2482
JICA Representatives				
12	Mr. Toru Kobayakawa	JICA Expert	JICA	9810 323 105
13	Mr. Masatoshi Yamada	JICA Expert	JICA	9810 267 913
JICA Study Team				
14	Mr. Akira Takechi	Team Leader	JICA Study Team	9582 786 201
15	Dr. Alok Kumar	Asst. Team Leader	JICA Study Team	9711 470 144
16	Mr. Kiyoshi Mizufune	Team Member	JICA Study Team	9582 337 835
17	Mr. Gururaj Rao	Team Member	JICA Study Team	9582 337 836
18	Dr. Kiyoshi Moriyama	Team Member	JICA Study Team	9582 337 837
19	Mr. Masaaki Mukatde	Team Member	JICA Study Team	-
20	Mr. Takenori Snoryuji	Team Member	JICA Study Team	8860 218 134
21	Mr. Rajesh Chandra	Team Member	JICA Study Team	9582 028 846
22	Mr. Takehiro Nakano	Team Member	JICA Study Team	8860 218 135
23	Mr. Gyan Sagar	Team Member	JICA Study Team	0120-2579 039
24	Mr. Jay Kant Singh	Team Member	JICA Study Team	9873 583 586
SMEC Team				
25	Mr. Deepak Sharma	Team Leader	SMEC (India)	9999 627 951
26	Mr. Rohit Srivastava	O&M Specialist	SMEC (India)	9811 549 547
27	Dr. Abhishek Saxena	Support Staff (WR Specialist)	SMEC (India)	9818 773 215

(C) Minutes of Third Expert Committee Meetings

(i) Minutes of Meeting held on 19th January 2011 related to Revision of the Manual on Sewerage and Sewage Treatment

The third meeting of the Expert Committee members, the JICA Study Team and the representatives of SMEC India (Pvt.) Ltd. for the Up-dating and Revision of the Manual on Sewerage and Sewage Treatment – Engineering (Part-A) was held under the Chairpersonship of Ms. E. P. Nivedita, Director (WS), MOUD on 19th January 2011 at 10.30 AM in conference room no. 103, A-Wing, Nirman Bhawan, New Delhi. List of participants is placed below as ***Annexure - I***.

At the outset, the Chairperson welcomed the members of the Expert Committee, experts from JICA Study Team and the representatives of SMEC India (Pvt.) Ltd. The Chairperson informed all the members that Mr. M. Dhinadhayalan, Member Secretary of the Expert Committee is not available as he is preoccupied for urgent work.

The Chairperson requested the JICA Study Team members to make a power point presentation on the findings of the field study conducted on the sewerage system for Allahabad, Bangalore and Chennai cities during 2 – 13 November, 2010 and to present the Draft Table of Contents with section and sub-section of the Manual on Sewerage and Sewage Treatment – Engineering (Part-A) which had been prepared by the JICA Study Team and discussed in the 2nd meeting of the Expert Committee Members. The Chairperson requested all the Expert Committee members to discuss and finalize the Draft Table of Contents with section and sub-section of the Manual formulated by JICA Study Team.

Dr. Alok Kumar, JICA Study Team made a power point presentation on the findings of their field visits and on the Draft Table of Contents with section and sub-section of the (Part – A) Manual brought out in the base document. Mr. Akira Takechi, Team Leader of JICA Study Team informed that his team focused on Operations & Maintenance carried out at different STPs during site visit. The base document was circulated to all the expert committee members for their comments.

Mr. Akira Takechi requested the Expert Committee members to assign the nomenclature of the manual for Engineering, Operation & Maintenance and Management part as Manual on Sewerage and Sewage Treatment, Manual on Operation & Maintenance of Sewerage and Sewage Treatment and Manual on Management of Sewerage and Sewage Treatment. Dr. Ramakant suggested that the existing nomenclature of the manual should be retained as Manual on Sewerage and Sewerage Treatment – Engineering (Part – A), Manual on Sewerage and Sewerage Treatment – Operation & Maintenance (Part – B) and Manual on Sewerage and Sewerage Treatment – Management (Part – C). The members of the Expert Committee were also of the same opinion.

Dr. Alok Kumar informed the Expert Committee members that the JICA Study Team has proposed new sections such as Supervisory Control and Data Acquisition (SCADA), Energy conservation, Carbon credit, Rehabilitation Technology for laying new/ replacement of sewer lines, MIS (Management Information System), Unmanned (with mechanical equipment) sewer pipe inspection and Trenchless Technology in the Manual

on Sewerage and Sewage Treatment (Part-A).

Prof. Vinod Tare suggested that the Chapter 3 i.e. Management, Administration, Legal and Financial Aspects which was proposed in the Part-A Manual should be transferred to Manual on Sewerage and Sewerage Treatment – Management (Part – C). Dr. S. Sundaramoorthy suggested that the Chapter 11 i.e. Environmental Impact Assessment and Risk Management proposed in (Part – A) Manual should be covered in Environmental Aspects of sub-section 5.3.1 (Criteria for Selection of Treatment Processes) of Chapter 5 (Design and Construction of Sewage Treatment Facilities) of (Part – A) Manual. The Expert Committee members were also of the same opinion.

After fruitful discussions, the Draft Table of Content for part A manual was finalized by the Expert Committee Members. Each Chapter, Section and Sub- Section was discussed in detail. The Table of Contents which are the part of the existing Manual needs to be studied further by the JICA Study Team so as to make the manual more informative as compared to the earlier Manual which is under revision. The Final Table of Contents was finalized and placed as ***Annexure II***.

Mr. Akira Takechi has given the presentation on the work plan for the next phase of the study to formulate the Chapters, sections and sub-sections for the Up-dating and Revision of the Manual on Sewerage and Sewage Treatment (Part – A). Mr. Akira Takechi informed the Expert Committee that the second phase of the study will start from April 2011 and Final Report of all the three Manuals (Part-A, Part-B & Part-C) will be submitted by the JICA Study team at the end of September 2012 (18 months from the date of start).

Mr. Akira Takechi also proposed to formulate 10 different working groups among the members of the two Expert Committees based on their expertise and the meeting of the Working Groups and Expert Committees will be organized at every 1-2 months and 4-5 months, respectively. Dr. S.R. Shukla suggested for formulating of 4 Working Groups from each of Expert Committees and each working group will have at least 2 and maximum of 5 expert members as per their expertise on the subject.

Dr. S.R. Shukla also suggested that the formulation of Working Group will be finalized by officers from CPHEEO in consultation with Expert Committee members. The draft manual will be formulated by JICA Study Team and the working groups will review each chapter/ section within a stipulated time frame and once the draft is approved by the Working Group, the same will be forwarded to the Expert Committee for their final review/ approval.

The Expert Committee also decided that some experts in the field of the Financial Management of sewerage system will be inducted in the committee for reviewing the chapters on Financial Management.

The Table of Contents of Up-dating and Revision of the Manual on Sewerage and Sewage Treatment (Part-A) were divided into four working groups. The details of the contents of the manual and the working groups are as under. However, the chapters for different working groups will be finalized in consultation with members.

Working Group	Names of Chapters Covered
A-1	<ol style="list-style-type: none"> 1. Introduction 2. Planning
A-2	<ol style="list-style-type: none"> 3. Design and Construction of Sewers 4. Design and Construction of Sewage Pumping Stations
A-3	<ol style="list-style-type: none"> 5. Design and Construction of Sewage Treatment Facilities 6. Design and Construction of Sludge Treatment Facilities
A-4	<ol style="list-style-type: none"> 7. Recycling and Reuse 8. Onsite Methods 9. Emerging Trends

It was informed by the JICA Study Team that **the 4th meeting of the Expert Committee will be held in the last week of April 2011 or in the first week of May 2011** depending upon the contract agreement for next phase study to be signed between JICA and JICA Study Team. The Expert Committee Members were agreed on the proposed schedule of the study for the next phase.

The meeting was ended with vote of thank to the chair.

Annexure - I

List of Participants				
Sr. No.	Name	Designation	Department	Contact No.
Expert Committee Members				
1	Ms. E.P. Nivedita	Director (WS) & Chairperson	MOUD	
2	Dr. S.R. Shukla	Retd. Adviser (PHE) & Co-Chairman	CPHEEO, MOUD	011-4565 5451
3	Dr. A.A. Kazmi	Associate Professor	Civil Engineering, IIT, Roorkee	9837 262 698
4	Mr. Nazimuddin	Senior Env. Engineer	Central Pollution Control Board, Delhi	
5	Mr. C. Lallunghnema	Joint Secretary	Public Health Engg. Deptt., Mizoram	09436 141 286
6	Mr. D.P. Singh	Ex. Chief Engineer (Ganga)	U.P. Jal Nigam, Allahabad	
7	Dr. S. Sundaramoorthy	Former Engineering Director	Chennai Metropolitan WS&SB, Chennai	9444 052 434
8	Prof. Vinod Tare	Professor	CE, IIT Kanpur	9415 130 517
9	Mr. A.K. Dhussa	Director	MNRE, New Delhi	
10	Dr. A.K. Nema	Associate Professor	CE, IIT Delhi	
11	Mr. D.K. Agrawal	Scientist-F	BIS, New Delhi	
12	Mr. R. Sethuraman	Retd. Joint Adviser	CPHEEO, MOUD	
13	Mr. B.B. Uppal	Retd. Deputy Adviser	CPHEEO, MOUD	
14	Mr. V.K. Chaurasia	Deputy Adviser	CHPEEO, MOUD	011- 2306 1144
15	Mr. J.B. Ravinder	Assistant Adviser	CHPEEO, MOUD	011-2306 1043
16	Dr. Ramakant	Assistant Adviser (Special invitee)	CPHEEO, MOUD	011-2306 2305
JICA Representatives				
14	Mr. Toru Kobayakawa	JICA Expert	JICA	9810 323 105
15	Mr. Masatoshi Yamada	JICA Expert	JICA	9810 267 913
16	Ms. Mino Sato	JICA Expert	JICA	
JICA Study Team Members				
17	Mr. Akira Takechi	Team Leader	JICA Study Team	9582 786 201
18	Dr. Alok Kumar	Asst. Team Leader	JICA Study Team	9711 470 144
19	Mr. Kiyoshi Mizufune	Team Member	JICA Study Team	9582 337 835
20	Mr. Gururaj Rao	Team Member	JICA Study Team	9582 337 836
21	Dr. Kiyoshi Moriyama	Team Member	JICA Study Team	9582 337 837
SMEC Team				
28	Mr. Deepak Sharma	Team Leader	SMEC (India)	9999 627 951
29	Mr. Rohit Srivastava	O&M Specialist	SMEC (India)	9811 549 547
30	Mr. Uday Singh	Support Staff	SMEC (India)	

(ii) Minutes of Meeting held on 20th January 2011 related to the preparation of Manual on Operation and Maintenance of Sewerage Systems

The third meeting of the Expert Committee members, the JICA Study Team and the representatives of SMEC India (Pvt.) Ltd. for the Up-dating and Revision of the Manual on Operation and Maintenance of Sewerage Systems (Part-B & C) was held under the Chairpersonship of Dr. S. R. Shukla on 20th January 2011 at 10.30 AM in conference room no. 103, A-Wing, Nirman Bhawan, New Delhi. The list of participants is placed below as ***Annexure - I.***

At the outset, the Chairperson welcomed the members of the Expert Committee, experts from JICA Study Team and the representatives of SMEC India (Pvt.) Ltd. The Chairperson requested the JICA Study Team members to make a power point presentation on the findings of the field study conducted on the sewerage system for Allahabad, Bangalore and Chennai cities during 2 – 13 November, 2010 and to present the Draft Table of Contents with section and sub-section of the Manual on Operation and Maintenance of Sewerage Systems (Part-B) which had been prepared by the JICA Study Team and discussed in the 2nd meeting of the Expert Committee Members. The Chairperson requested all the Expert Committee members to discuss and finalize the Draft Table of Contents with section and sub-section of the Manual formulated by JICA Study Team.

Dr. Alok Kumar, JICA Study Team made a power point presentation on the findings of their field visits and on the Draft Table of Contents with section and sub-section of the (Part – B & C) Manual brought out in the base document. Mr. Akira Takechi, Team Leader of JICA Study Team informed that his team focused on Operations & Maintenance carried out at different STPs during site visit. The base document was circulated to all the expert committee members for their comments.

Mr. Akira Takechi requested the Expert Committee members to assign the nomenclature of the manual for Engineering, Operation & Maintenance and Management part as Manual on Sewerage and Sewage Treatment, Manual on Operation & Maintenance of Sewerage and Sewage Treatment and Manual on Management of Sewerage and Sewage Treatment. Dr. Ramakant suggested that the existing nomenclature of the manual should be retained as Manual on Sewerage and Sewerage Treatment – Engineering (Part – A), Manual on Sewerage and Sewerage Treatment – Operation & Maintenance (Part – B) and Manual on Sewerage and Sewerage Treatment – Management (Part – C). The members of the Expert Committee were also of the same opinion.

After fruitful discussions, the Draft Table of Content (Part-B) was finalized by the Expert Committee Members. Each Chapter, Section and Sub- Section was discussed in detail. The Table of Contents which are the part of the existing Manual needs to be studied further by the JICA Study Team so as to make the manual more informative as compared to the earlier Manual which is under revision. The Expert Committee members has suggested to formulate the Manual on Sewerage and Sewerage Treatment – Operation & Maintenance (Part – B) with inclusion of new sections which are Supervisory Control and Data Acquisition (SCADA), Intermediate lift station, Gas engine, Gas scrubber, Energy conservation, Carbon credit, Upkeeping of plant laboratory and Cost recovery. The Final

Table of Contents was finalized and placed as ***Annexure II***.

Mr. Akira Takechi has given the presentation on the work plan for the next phase of the study to formulate the Chapters, sections and sub-sections for the formulation of Manual on Sewerage and Sewerage Treatment – Operation & Maintenance (Part – B). Mr. Akira Takechi informed the Expert Committee that the second phase of the study will start from April 2011 and Final Report of all the three Manuals (Part-A, Part-B & Part-C) will be submitted by the JICA Study at the end of September 2012 (18 months from the date of start).

Mr. Akira Takechi also proposed to formulate 10 different working groups among the members of the two Expert Committees based on their expertise and the meeting of the Working Groups and Expert Committees will be organized at every 1-2 months and 4-5 months, respectively. Dr. S.R. Shukla suggested for formulating of 4 Working Groups from each of Expert Committees and each working group will have at least 2 and maximum of 5 expert members as per their expertise on the subject.

Dr. S.R. Shukla also suggested that the formulation of Working Group will be finalized by officers from CPHEEO in consultation with Expert Committee members. The draft manual will be formulated by JICA Study Team and the working groups will review each chapter/section within a stipulated time frame and once the draft is approved by the Working Group, the same will be forwarded to the Expert Committee for their final review/approval.

The Expert Committee also decided that some experts in the field of the Financial Management of sewerage system will be inducted in the committee for reviewing the chapters on Financial Management.

The Table of Contents of the Manual on Sewerage and Sewerage Treatment – Operation & Maintenance (Part – B) were divided into four working groups. The details of the contents of the manual and the working groups are as under. However, the chapters for different working groups will be finalized in consultation with members.

Working Group	Names of Chapters Covered
B-1	1. General 9. Safety and Health Management 11. Budget Estimates for Operation and Maintenance
B-2	2. Sewer Systems 3. Pumping Stations 6. Electrical and Instrumentation Facilities
B-3	4. Sewage Treatment Facilities 5. Sludge Treatment Facilities 7. Quality Analysis
B-4	8. Environmental Conservation 10. Onsite Systems

The Table of Contents of the Manual on Sewerage and Sewerage Treatment – Management (Part – C) were divided into two categories as under:

Working Group	Names of Chapters Covered
C-1	1. General 2. Institutional Framework 4. Community Participation 5. Public Private Partnership
C-2	3. Financial Management 6. Asset Management 7. Management Information System

It was informed by the JICA Study Team that **the 4th meeting of the Expert Committee will be held in the last week of April 2011 or in the first week of May 2011** depending upon the contract agreement for next phase study to be signed between JICA and JICA Study Team. The Expert Committee Members were agreed on the proposed schedule of the study for the next phase.

The meeting was ended with vote of thank to the chair.

Annexure – I

List of Participants				
Sr. No.	Name	Designation	Department	Contact No.
MoUD Representative				
Expert Committee Members				
1.	Dr S.R. Shukla	Member, Chairman	Former Adviser (PHEE), CPHEEO Min. of U. D.	011-4565 5491
2.	Mr. K.L. Swara	Director (Planning & Design)	PWSSB	
3.	Mr. S.M. Jejurikar	Chief Engineer	Municipal Corporation, Greater Mumbai	9820 547 663
4.	Mr. Dilip Kumar Padhi	Chief Engineer, Member Secretary	Orissa Water Supply & Sewerage Board,	9337 103 400
5.	Dr. A.A. Kazmi	Associate Prof.	IIT, Roorkee	9837 262 698
6.	Mr. J.P. Mani	Project Manager	U.P. Jal Nigam, Allahabad	9473 942 674
7.	Dr. S. Sundaramoorthy	Retd. Engg. Director	CMWSSB, Chennai	9444 052 434
8.	Mr. G. Elangovan	Retd. Engg. Director	CMWSSB, Chennai	7845 055 533
9.	Mr. M. Sankaranarayanan	Retd. Joint Advisor	CPHEEO	9480 813 108
10.	Mr. R. Sethuraman	Retd. Advisor	CPHEEO	
11.	Mr. J.B. Ravinder	Assistant Adviser	CPHEEO	011-2306 2482
12.	Dr. Ramakant	Asst. Advisor	CPHEEO	
JICA Representatives				
13.	Mr. Toru Kobayakawa	JICA Expert	JICA	9810 323 105
14.	Mr. Masatoshi Yamada	JICA Expert	JICA	9810 267 913
15.	Ms. Mino Sato	JICA Expert	JICA	
JICA Study Team				
16.	Mr. Akira Takechi	Team Leader	JICA Study Team	9582 786 201
17.	Dr. Alok Kumar	Asst. Team Leader	JICA Study Team	9711 470 144
18.	Mr. Kiyoshi Mizufune	Team Member	JICA Study Team	9582 337 835
19.	Mr. Gururaj Rao	Team Member	JICA Study Team	9582 337 836
20.	Dr. Kiyoshi Moriyama	Team Member	JICA Study Team	9582 337 837
SMEC Team				
21.	Mr. Deepak Sharma	Team Leader	SMEC (India)	9999 627 951
22.	Mr. Rohit Srivastava	O&M Specialist	SMEC (India)	9811 549 547
23.	Mr. Uday Singh	Support Staff	SMEC (India)	

APPENDIX – A5-3

***Modified Draft Table of Contents in Second
Expert Committee Meetings***

DRAFT OF TABLE OF CONTENTS OF PART A: ENGINEERING

CHAPTER 1	INTRODUCTION
1.1	Preamble
1.2	Overview
1.3	Objective (include both sewerage and onsite part)
CHAPTER 2	PLANNING
2.1.	Basic Consideration (need for planning)
2.2.	Survey
2.3.	Planning of Sewage Treatment
2.4.	Planning of Sludge Treatment
2.5.	Planning of Facilities
2.6.	Planning of Utilization of Resources and Space
2.7.	Planning Reconstruction
2.8.	Considerations for Planning of Regional Sewerage System
2.9.	Master Plan of Small Scale Sewerage
2.10.	Environmental Preservation
2.11.	Design Criteria
2.12.	Engineering Reports and Facility Plans
2.13.	Engineering Plans and Specifications
CHAPTER 3	MANAGEMENT, ADMINISTRATION, LEGAL AND FINANCIAL ASPECTS
3.1.	Management
3.2.	Common Aspects of Management
3.3.	Other Aspects of Management
3.4.	Legal Aspects
3.5.	Financial Aspects
CHAPTER 4	DESIGN AND CONSTRUCTION OF SEWERS
4.1.	General
4.2.	Types of Collection System (including vacuum also)
4.3.	Types and Materials of Sewers
4.4.	Hydraulics (Design Capacity and Design Flow, Depth of Sewers, etc.)
4.5.	Design Considerations for Sewer System
4.6.	Design of Sewer systems (- Old manual Chapter 3, Chapter 4, Chapter 5, Chapter 6, Chapter 7, plus present additions, Decentralized system)
4.7.	Protection and Bed of Sewer

- 4.8. Connection and Joint of Sewer
 - 4.9. Type and Cross Section of Open Conduit
 - 4.10. House Inlet and Connection
 - 4.11. House Connections
 - 4.12. Manholes
 - 4.13. Inverted Siphons
 - 4.14. Protection of Water Supplies
 - 4.15. Sewer Reconstruction/Rehabilitation
- CHAPTER 5 DESIGN AND CONSTRUCTION OF SEWAGE PUMPING STATIONS
- 5.1. General
 - 5.2. Design (Chapter 9) plus latest additions
 - 5.3. Suction-Lift Pump Stations – Special Considerations
(Types and Specifications of Suction Pumps)
 - 5.4. Submersible Pump Stations – Special Considerations
(Types and Specifications of Submersible Pumps)
 - 5.5. Screw Pump Stations – Special Considerations
(Types and Specifications of Screw Pumps)
 - 5.6. Alarm Systems
 - 5.7. Instrumentation and Equipment
(Valves, Flow Measurement (Old Manual Chapter 25 plus latest))
 - 5.8. Force Mains
 - 5.9. Pressure Sewer System
 - 5.10. Reconstruction/Rehabilitation of Pumping Station
- CHAPTER 6 DESIGN (AND CONSTRUCTION) OF SEWAGE TREATMENT FACILITIES
- 6.1. General
 - 6.2. Fundamental Principle of Biological Treatment
 - 6.3. Selection of Sewage Treatment Process
 - 6.4. Plant Location
 - 6.5. Quality of Effluent
 - 6.6. Design (Old Manual Chapter 10, Chapter 11, Chapter 12, Chapter 13, Chapter 14, Chapter 15, Chapter 16, Chapter 26, Suitable for decentralized sewerage, plus additions)
 - 6.7. Plant Details
 - 6.8. Plant Outfalls
 - 6.9. Essential Facilities

6.10.	Control Facilities
6.11.	Safety
6.12.	Laboratory
6.13.	Screening, Grit Removal and Flow Equalization
6.14.	Settling
6.15.	Sewage Treatment
6.16.	Disinfection Facility
6.17.	Electrical and Instrumentation Facility
6.18.	Reconstruction/Rehabilitation of Sewage Treatment Facilities
CHAPTER 7	DESIGN AND CONSTRUCTION OF SLUDGE TREATMENT FACILITIES
7.1.	General
7.2.	Process Selection (Old Manual Chapter 17, Chapter 18, plus additions)
7.3.	Sludge Drying Bed
7.4.	Sludge Thickener
7.5.	Anaerobic Sludge Digestion
7.6.	Aerobic Sludge Digestion
7.7.	Sludge Pumps and Piping
7.8.	Sludge Dewatering
7.9.	Sludge Storage and Disposal
7.10.	Reconstruction/Rehabilitation of Sludge Facilities
7.11.	Biomethanation and Energy Recovery (Carbon Credit)
CHAPTER 8	RECYCLING AND REUSE
8.1.	Treated Water Reclamation and Reuse Facilities (Old Manual Chapter 19, Chapter 20, plus addition)
CHAPTER 9	ONSITE MANAGEMENT
9.1.	Background
9.2.	Septic Tank
9.3.	Pour Flush Water Seal Latrines
9.4.	An Overview of Other Alternative Onsite Sanitation
9.5.	Night Soil Digesters
9.6.	Mini Package Treatment Plants
9.7.	Management of New Onsite Sanitation
CHAPTER 10	NEWER TRENDS
10.1.	Supplemental Treatment Processes

10.2.	Disinfection (Problems related to use of chlorine and alternative option)
10.3.	Supplemental Sewers
CHAPTER 11	Environmental Impact Assessment and Risk Assessment

DRAFT OF TABLE OF CONTENTS ON PART B: OPERATION AND MAINTENANCE

CHAPTER 1	GENERAL
1.1.	Introduction
1.2.	Basic Considerations
1.3.	Outline of Operation and Maintenance
1.4.	Organization for Operation and Maintenance
1.5.	Public Awareness
1.6.	Disaster Management
1.7.	Sewerage Ledger
CHAPTER 2	SEWER SYSTEMS (Consider Chapter 8 of old Manual)
2.1.	Introduction
2.2.	Inspection and Survey
2.3.	Sewer Cleaning
2.4.	Sewer Rehabilitation (Material, Methodology, Equipment, Long Term and Short Term)
2.5.	Protection of Sewer Systems
2.6.	Safety Practices
2.7.	Protection against Infiltration and Ex-filtration
2.8.	Manholes and Appurtenances
2.9.	House Service Connection
2.10.	Troubleshooting
CHAPTER 3	PUMPING STATIONS
3.1.	Introduction
3.2.	Types and Structure of Pumping Stations
3.3.	Gate and Valves
3.4.	Screen
3.5.	Grit Chamber
3.6.	Grit Removal Equipment
3.7.	Wet Well
3.8.	Pump Equipment
3.9.	Flow Measuring Devices
3.10.	Preventive Maintenance (including Civil, DOs and DONTs)
3.11.	Safety Practices
3.12.	Troubleshooting
CHAPTER 4	SEWAGE TREATMENT FACILITIES (technologies same as in Design

Manual)

- 4.1. Introduction
- 4.2. Pump Equipment (Refer to Chapter 3)
- 4.3. Fine Screen and Grit Chamber
- 4.4. Oil and Grease Removal
- 4.5. Equalization
- 4.6. Primary Treatment
- 4.7. Activated Sludge Process (ASP)
 - 4.7.1 Activated Sludge Process – Conventional and Extended Aeration (ASP-Ext. Aeration)
 - 4.7.2 Activated Sludge Process – Extended Aeration, Chemical Aided Flocculation and Tertiary Sedimentation (ASP-Ext. Aeration-Ter. Sed.)
 - 4.7.3 High Rate Activated Sludge Process
 - 4.7.4 Sequential Batch Reactor (SBR)
- 4.8. Aerated Lagoon
- 4.9. Oxidation Ditch
- 4.10. Fluidized Bioreactors (Refer Metcalf & Eddy)
 - 4.10.1 Moving Biobed Reactor
- 4.11. Biotower
 - 4.11.1 Trickling Filter
 - 4.11.2 Synthetic Media Filter
- 4.12. Membrane Bioreactor
- 4.13. Upflow Anaerobic Sludge Blanket Reactor (UASB) including Post Treatment (DHS, FPU, Duckweed Pond)
- 4.14. Waste Stabilization Pond (including Aerobic, Anaerobic, and Facultative and Maturation ponds)
- 4.15. Farm Forestry
- 4.16. Aeration Equipment
 - 4.16.1 Blower
 - 4.16.2 Aerator
 - 4.16.3 Actuator
- 4.17. Fish Pond
- 4.18. Integrated Nutrient Removal
- 4.19. Disinfection Facility
- 4.20. Advanced Treatment (PSF-Pressure Sand Filter, DMF-Dual Media Filter, UF, RO)

4.21.	Preventive Maintenance (including Civil, DO's and DON'Ts)
4.22.	Safety Practices
4.23.	Troubleshooting
CHAPTER 5	SLUDGE TREATMENT FACILITIES
5.1.	Introduction (General Management of Sludge Treatment Facilities)
5.2.	Sludge Thickening
5.3.	Aerobic Digestion
5.4.	Anaerobic Digestion (Gas collection, Power generation, etc.)
5.5.	Sludge Dehydrator
5.6.	Sludge Drying Bed
5.7.	Preventive Maintenance (including Civil, DO's and DON'Ts)
5.8.	Safety Practices
5.9.	Troubleshooting
CHAPTER 6	ELECTRICAL AND INSTRUMENTATION FACILITIES
6.1.	Introduction
6.2.	Power Supply Facilities and (including Dual Fuel Engine)
6.3.	Standby Power Supply (Generator)
6.4.	Prime Movers (Motor and Drives)
6.5.	Instrumentation Facility (including Automation)
6.6.	Energy Audit (refer Water Supply O&M Manual)
6.7.	Record of Operation and Maintenance and Its Utilization
6.8.	Preventive Maintenance (including Civil, DO's and DON'Ts)
6.9.	Safety Practices
6.10.	Troubleshooting
CHAPTER 7	QUALITATIVE ANALYSIS
7.1.	Introduction
7.2.	Sampling
7.3.	Relevance of Parameters (Contents of Analysis Parameters)
7.4.	Analysis Parameters and Frequency
7.5.	Alternative Methods (Spot tests, Transparency, etc.)
7.6.	Data Analysis (Accuracy and Precision)
CHAPTER 8	ENVIRONMENTAL CONSERVATION
8.1.	Introduction
8.2.	Measures against Odor
8.3.	Measures against Air Pollution (Bioaerosols)

8.4.	Measures against Noise and Vibration
8.5.	Measures against Soil Contamination and Groundwater Pollution
8.6.	Measures against Natural Calamities (Earthquake, Flood, etc.)
8.7.	Regulation of Global Warming Gas
8.8.	Plant Beautification and Landscaping
CHAPTER 9	SAFETY AND HEALTH MANAGEMENT
9.1.	Introduction
9.2.	Safety Organization
9.3.	Management Method
9.4.	Workers' Welfare, Safety and Health Measures
CHAPTER 10	ONSITE SYSTEMS
CHAPTER 11	Budget Estimates for Operation and Maintenance

DRAFT OF TABLE OF CONTENTS OF PART C: MANAGEMENT

CHAPTER 1	INSTITUTIONAL FRAMEWORK
1.1	Legal Aspect (Regulatory Framework)
1.1.1	General
1.1.2	Water (Prevention and Control of Pollution) Act in 1974
1.1.3	Water (Prevention and Control of Pollution) Cess Act in 1977
1.1.4	Environment (Protection) Act in 1986
1.1.5	Designated-Best-Use by Bureau of Indian Standard and Central Pollution Control Board in 1981
1.1.6	General Standard for Discharge of Environmental Pollutants under the Environment Protection Rules in 1989
1.2	Financial Aspect
1.2.1	General
1.2.2	Scope
1.2.3	Capital and Revenue
1.2.4	Sources for Raising Capital
1.2.5	Method of Raising Revenue
1.2.6	Financial Appraisal
1.2.7	Statutory Water and Sanitation Boards
1.3	Human Resources Development (Worker Welfare)
1.3.1	Need for Human Resources Development
1.3.2	Job Description
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