Association Française pour l'Etude des Eaux

DOCUMENT NON SELECTIONNE

Trop spécialisé ☐
Sans intérêt ☐
Pas de mon domaine ☐
Pas le temps ☐

NUMERO F 6068

NOM : M MANSOTTE

DATE ENVOI :

DATE RETOUR :

*AUTEURS .
*TYPE .RAPPORT 66 170667
*TITRE .Disinfection of rural and small-community water supplies, a manual for design and operation
*SOURCE .GENEVE,OMS
*DATE .1989
*PAGES .135
*COTE .F6068

Références

X1 X3

Titre original :

Titre traduit :

DESCRIPTEUR(S) (pris dans le Thésaurus National-Eau) et éventuellement MOTS-LIBRES	COMMENTAIRE (Micro résumé de 30 mots environ)

World Health Organization
Regional Office for Europe
Copenhagen

DISINFECTION OF RURAL AND SMALL-COMMUNITY WATER SUPPLIES

66/70657

A MANUAL FOR DESIGN AND OPERATION

WRc

EDITORIAL TEAM

Project Leader			
O Espinoza	WHO	Copenhagen	Denmark
Consultant			
Dr P. Benedek		Budapest	Hungary
Editor			
J Warden	WRc	Stevenage	United Kingdom
Main Contributors			
X Bonnefoy	DDASS	Vosges	France
E Dahi	DTH	Lyngby	Denmark
J Kiss	VITUKI	Budapest	Hungary
W Lewis	WHO	Copenhagen	Denmark
J Warden	WRc	Stevenage	United Kingdom

ISBN 0 902156 76 42

©World Health Organization 1989

Publications of the World Health Organization enjoy copyright protection in accordance with the provisions of Protocol 2 of the Universal Copyright Convention. For rights of reproduction or translation of WHO publications, in part or *in toto*, applications should be made to the Office of Publications, World Health Organization, Geneva, Switzerland. The World Health Organization welcomes such applications.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

CONTENTS

		page
1.	**INTRODUCTION**	1
1.1	**Origins and Audiences**	1
1.1.1	Origins	1
1.1.2	Audiences	1
1.2	**Problems Considered**	1
1.2.1	A common challenge	1
1.2.2	Ethical aspects	2
1.2.3	Rural areas	2
1.2.4	Rural water supply systems	2
1.2.5	Supplies serving individual or small groups of dwellings	2
1.2.6	Aspects of water supplies included in the Manual	3
1.3	**Barriers and Disinfection**	3
1.3.1	Barriers	3
1.3.2	Disinfection	3
2.	**HEALTH ASPECTS**	4
2.1	**Waterborne Diseases**	4
2.1.1	London cholera outbreak 1855	4
2.1.2	Filtration - Hamburg cholera outbreak 1895	4
2.1.3	Classification of diseases	4
2.1.4	Importing diseases	5
2.2	**Water Quality Requirements**	6
2.2.1	Pathogenic micro-organisms	6
2.2.2	Escherichia coli	6
2.2.3	Viral contamination	7
2.2.4	Other pathogens	7
2.2.5	Chemical contamination	7
2.2.6	Multiple defences	8
2.2.7	Water quality criteria	8
3.	**PROTECTION OF SUPPLIES**	9
3.1	**Introduction**	9
3.2	**Establishment of New Supply**	9
3.3	**Principles of Protection**	9
3.3.1	Inner protection zones	10
3.3.2	Outer protection zones	10
3.3.3	Catchments	11
3.3.4	Sizes of protection zones	11
3.4	**Practices of Protection**	11
3.4.1	Springs	12
3.4.2	Wells	14

		page
3.4.3	Treatment works	14
3.4.4	Pipelines	14
3.4.5	Sealing abandoned sources	15
4.	**WATER SUPPLY SYSTEMS**	16
4.1	**Demand**	16
4.1.1	Domestic demand	16
4.1.2	Institutional and trade demands	16
4.1.3	Agricultural demands	16
4.1.4	Future demands	17
4.1.5	Meeting peak demands	17
4.2	**Design**	17
4.2.1	General	17
4.2.2	Service reservoirs and similar structures	17
4.2.3	Pipelines and pumping mains	18
4.2.4	Sewer flushing arrangements	18
4.2.5	Backsiphonage	18
4.3	**Construction, Operation and Maintenance**	18
4.3.1	General	18
4.3.2	Service reservoirs and similar structures	19
4.3.3	Pipelines	19
4.3.4	Community supply points	19
5.	**PRE-TREATMENT BEFORE DISINFECTION**	21
5.1	**Storage and Sedimentation**	21
5.1.1	Reservoir storage	21
5.1.2	Storage basins	22
5.1.3	Plain sedimentation	23
5.1.4	Sizing a plain sedimentation tank	25
5.1.5	Sub surface storage	26
5.2	**Infiltration**	27
5.2.1	Bank-side galleries	28
5.2.2	River-bed galleries	29
5.3	**Filtration**	29
5.3.1	How filters work	29
5.4	**Rapid Rough Filtration (Coarse Gravel)**	32
5.4.1	Filter mechanisms	32
5.4.2	Design	33
5.4.3	Filter cleaning	34
5.5	**Rapid Filtration**	34
5.5.1	Sizing rapid filters for small supplies	35
5.5.2	Filter sludge	36
5.6	**Slow Sand Filtration**	36
5.6.1	Sizing slow sand filters	37

		page
5.7	**Other Pre-Treatment Processes**	40
5.7.1	Reasons for changing pH	40
5.8	**Alkali Dosing**	40
5.9	**Contact Beds**	41
5.9.1	Design of contact beds	41
5.10	**Aeration**	42
5.10.1	Methods of aeration	43
5.11	**Iron and Manganese**	44
5.12	**Tastes and smells**	44
5.12.1	Treatment	45
5.13	**Coagulation**	45
6.	**DISINFECTION**	46
6.1	**Disinfection Methods**	46
6.2	**Chlorination**	46
6.2.1	Contact time and exposure value	47
6.2.2	Chlorine chemistry	47
6.2.3	Combined chlorine	48
6.2.4	Chlorine residual	50
6.2.5	Techniques of chlorination	50
6.2.6	Methods of dosing	51
6.3	**Calcium Hypochlorite**	52
6.3.1	Hypochlorite tablet dosers	52
6.3.2	Disinfecting wells with bleaching powder	54
6.3.3	Bleaching powder solution	57
6.4	**Sodium Hypochlorite**	58
6.4.1	Hypochlorite solution dosers	59
6.4.2	Gravity-driven units	59
6.4.3	Water-powered units	62
6.4.4	Electric dosing pumps	66
6.4.5	Hypochlorite dosing pumps - summary	69
6.5	**Chlorine Gas**	70
6.5.1	Gas chlorinators, vacuum type	71
6.5.2	Electrochlorinators	73
6.5.3	Method of production	73
6.5.4	Process requirements	74
6.6	**Chlorine Dioxide**	74
6.7	**Chlorine Contact Tanks**	75
6.8	**Control of Chlorination**	77
6.8.1	How chlorine controllers work	78

		page
5.7	**Other Pre-Treatment Processes**	40
5.7.1	Reasons for changing pH	40
5.8	**Alkali Dosing**	40
5.9	**Contact Beds**	41
5.9.1	Design of contact beds	41
5.10	**Aeration**	42
5.10.1	Methods of aeration	43
5.11	**Iron and Manganese**	44
5.12	**Tastes and smells**	44
5.12.1	Treatment	45
5.13	**Coagulation**	45
6.	**DISINFECTION**	46
6.1	**Disinfection Methods**	46
6.2	**Chlorination**	46
6.2.1	Contact time and exposure value	47
6.2.2	Chlorine chemistry	47
6.2.3	Combined chlorine	48
6.2.4	Chlorine residual	50
6.2.5	Techniques of chlorination	50
6.2.6	Methods of dosing	51
6.3	**Calcium Hypochlorite**	52
6.3.1	Hypochlorite tablet dosers	52
6.3.2	Disinfecting wells with bleaching powder	54
6.3.3	Bleaching powder solution	57
6.4	**Sodium Hypochlorite**	58
6.4.1	Hypochlorite solution dosers	59
6.4.2	Gravity-driven units	59
6.4.3	Water-powered units	62
6.4.4	Electric dosing pumps	66
6.4.5	Hypochlorite dosing pumps - summary	69
6.5	**Chlorine Gas**	70
6.5.1	Gas chlorinators, vacuum type	71
6.5.2	Electrochlorinators	73
6.5.3	Method of production	73
6.5.4	Process requirements	74
6.6	**Chlorine Dioxide**	74
6.7	**Chlorine Contact Tanks**	75
6.8	**Control of Chlorination**	77
6.8.1	How chlorine controllers work	78

ANNEXES

		page
ANNEX 1/1	Member States of the WHO European Region	105
ANNEX 1/2	Some Scientific Terms	106
ANNEX 2/1	Notes on some Water-borne Diseases and their Microbial Sources	107
ANNEX 2/2	Notes on Schistosomiasis and Guinea-worm Disease ('Water-based' Diseases)	109
ANNEX 2/3	Notes on Malaria and African Sleeping Sickness ('Water-related' Diseases)	110
ANNEX 2/4	Notes on 'New' Diseases and on Bacteria Hitherto Considered Inoffensive	111
ANNEX 2/5	Water Quality Criteria	112
ANNEX 3/1	Groundwater Protection Zones	113
ANNEX 4/1	A Valve to Prevent Backsiphonage	114
ANNEX 5/1	The Main Features of the Pre-treatment Methods	115
ANNEX 5/2	pH and Alkalinity	120
ANNEX 5/3	Contact Media for pH Adjustment	123
ANNEX 5/4	Treatment to Remove Iron and Manganese	126
ANNEX 6/1	The Main Features of Disinfection Systems	129
ANNEX 6/2	Treatment Process Selection Chart	135