

Principles and Practices of Drinking-water Chlorination

A guide to strengthening chlorination practices in
small- to medium-sized water supplies



**World Health
Organization**

Regional Office for South-East Asia

Principles and Practices of Drinking-water Chlorination

*A guide to strengthening chlorination practices in
small- to medium-sized water supplies*

Principles and practices of drinking-water chlorination: a guide to strengthening chlorination practices in small-to medium-sized water supplies.

ISBN: 978-92-9022-536-2

© World Health Organization 2017

Some rights reserved. This work is available under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 IGO licence (CC BY-NC-SA 3.0 IGO; <https://creativecommons.org/licenses/by-nc-sa/3.0/igo>).

Under the terms of this licence, you may copy, redistribute and adapt the work for non-commercial purposes, provided the work is appropriately cited, as indicated below. In any use of this work, there should be no suggestion that WHO endorses any specific organization, products or services. The use of the WHO logo is not permitted. If you adapt the work, then you must license your work under the same or equivalent Creative Commons licence. If you create a translation of this work, you should add the following disclaimer along with the suggested citation: “This translation was not created by the World Health Organization (WHO). WHO is not responsible for the content or accuracy of this translation. The original English edition shall be the binding and authentic edition”.

Any mediation relating to disputes arising under the licence shall be conducted in accordance with the mediation rules of the World Intellectual Property Organization.

Suggested citation. Principles and practices of drinking-water chlorination: a guide to strengthening chlorination practices in small-to medium-sized water supplies. New Delhi: World Health Organization, Regional Office for South-East Asia; 2017. Licence: CC BY-NC-SA 3.0 IGO.

Cataloguing-in-Publication (CIP) data. CIP data are available at <http://apps.who.int/iris>.

Sales, rights and licensing. To purchase WHO publications, see <http://apps.who.int/bookorders>. To submit requests for commercial use and queries on rights and licensing, see <http://www.who.int/about/licensing>.

Third-party materials. If you wish to reuse material from this work that is attributed to a third party, such as tables, figures or images, it is your responsibility to determine whether permission is needed for that reuse and to obtain permission from the copyright holder. The risk of claims resulting from infringement of any third-party-owned component in the work rests solely with the user.

General disclaimers. 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 WHO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by WHO 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.

All reasonable precautions have been taken by WHO to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall WHO be liable for damages arising from its use.

Contents

Acronyms and Abbreviations.....	v
Acknowledgements.....	vii
Introduction.....	1
1. What is the aim of this guide?	1
2. For whom is the guide intended?	1
3. How is the guide structured?.....	1
4. Part 1. Chlorination principles	2
1.1 What is chlorination?	3
1.2 Properties of chlorine.....	4
1.3 Principles of drinking-water chlorination	5
1.3.1 Chlorine dose	5
1.3.2 Chlorine reactions in drinking-water	6
1.3.3 Chlorine demand	8
1.3.4 Chlorine decay	10
1.3.5 Ct concept for disinfection.....	12
1.3.6 Aesthetic considerations for chlorination.....	15
1.3.7 Optimizing the chlorine concentration in a water supply system	15
1.3.8 Points of chlorine application.....	16
1.4 Summary of the conditions required for effective chlorination.....	19
5. Part 2. Practical chlorination	20
2.1 Safe handling and storage of chlorine.....	21
2.2 Chlorine liquid dosing systems	23
2.2.1 Non-pump based dosing systems.....	23
2.2.2 Pump based dosing systems.....	24
2.3 Chlorine dosing calculations.....	25
2.3.1 How to calculate the chlorine demand	25
2.3.2 How to calculate the Ct value for disinfection	26
2.3.3 How to calculate the required chlorine dose.....	28
2.3.4 How to calculate the amount of chlorine powder required to make a chlorine liquid solution.....	28
2.3.5 How to calculate the chlorine dose rate	30

2.4	Developing standard operating procedures for chlorination.....	34
2.5	Chlorine monitoring.....	34
2.5.1	Chlorine testing equipment.....	34
2.5.2	Chlorine sampling considerations.....	36
2.5.3	Operational monitoring for optimized chlorination	36
2.6	Summary	39
6.	Toolbox	42
A)	Generic standard operating procedures for drinking-water chlorination.....	43
B)	Chlorine dosing cheat-sheet.....	48
C)	Calculating the Ct value for disinfection	50
	Glossary of Terms.....	59

Acronyms and Abbreviations

%	percent
<	less than
>	greater than
≥	greater than or equal to
AWWA	American Water Works Association
Ct	Product of disinfectant concentration and time of contact
DBPs	disinfection by-products
DPD	N,N-diethyl-p-phenylenediamine
Eq	equation
FIFO	first in, first out
g	gram
h	hour
HAAs	haloacetic acids
HWTS	household water treatment and safe storage
kg	kilogram
L	litres
L/h	litres per hour
L/min	litres per minute
m ³	cubic meters
m ³ /h	cubic meters per hour
m ³ /min	cubic meters per minute
MDG	Millennium Development Goal
mg/L	milligrams per litre
min	minute
min.mg/L	minutes per milligram per litre
NTU	nephelometric turbidity unit
°C	degree Celsius
PPE	personal protective equipment

SEARO	South-East Asia Regional Office
SOP	standard operating procedure
THMs	trihalomethanes
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organization
WSP	Water safety plan

预览已结束，完整报告链接

<https://www.yunbaogao.cn/report/index/re>