

References

- ACWWA. 2004. *Atlantic Canada Guidelines for the Supply, Treatment, Storage, Distribution and Operation of Drinking Water Supply Systems*.
- AWWA. 1991. *Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources*.
- AWWA. 1971. *Water Quality and Treatment: A handbook of Public Water Supply*. McGraw-Hill Inc., New York, NY.
- AWWA and ASCE. 1990. *Water Treatment Plant Design*. Second Edition, McGraw-Hill Inc., New York, NY.
- Campbell, A.T., et al. 1995. "Inactivation of Oocysts of *Cryptosporidium parvum* by Ultraviolet Radiation." *Water Res.* 29(11):2583
- Carlson, D.A., et al. 1982. *Project Summary: Ultraviolet Disinfection of Water for Small Water Supplies*. Office of Research and Development, USEPA; Cincinnati, OH, EPA/600/S2-85/092.
- Clancy, J.L., Hargy, T.M., Marshall, M.M., and Dyksen, J.E. 1997. "Inactivation of *Cryptosporidium parvum* Oocysts in Water Using Ultraviolet Light." Conference proceedings, AWWA International Symposium on *Cryptosporidium* and Cryptosporidiosis, Newport Beach, CA.
- Combs, R. and McGuire, P. 1989. "Back to Basics – The Use of Ultraviolet Light for Microbial Control." *Ultrapure Water Journal*. 6(4):62-68.
- Culp, J.L. and Culp, R.L. 1974 *New Concepts in Water Purification*. Van Nostrand Reinhold Environmental Series. New York.
- DeMers, L.D. and Renner, R.C. 1992. *Alternative Disinfection Technologies for Small Drinking Water Systems*. AWWARF.
- Ellis, C. and Wells, A.A. 1941. *The Chemical Action of Ultraviolet Rays*. Reinhold Publishing Co., New York, NY.
- Environment Canada. 2000. *Atlantic Canada Standards and Guidelines Manual for the Collection, Treatment, and Disposal of Sanitary Sewage*.
- Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environment Managers. 1997. *Recommended Standards for Wastewater Facilities*. Health Research Inc., Albany, NY.

- Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environment Managers. 2003. *Recommended Standards for Water Works*. Health Research Inc., Albany, NY.
- Hazen and Sawyer. 1992. *Disinfection Alternatives for Safe Drinking Water*. Van Nostrand Reinhold, New York, NY.
- Huff, C.B. 1965. "Study of Ultraviolet Disinfection of water and Factors in Treatment Efficiency." *Public Health Reports*. 80(8):695-705.
- Jagger, J. 1967. *Introduction to Research in Ultraviolet Photobiology*. Prentice-Hall Inc., Englewood Cliffs, NJ.
- Johnson, R.C. 1997. "Getting the Jump on Cryptosporidium with UV." *Opflow*. 23(10):1.
- Karanis, P., et al. 1992. "UV Sensitivity of Protozoan Parasites." *J. Water Supply Res. Technol. Aqua*. 41(2):95.
- Kruithof, J.C., et al. 1989. Summaries, *WASSER BERLIN '89*; International Ozone Association, European Committee, Paris.
- Malley Jr., J.P., Shaw, J.P., and Ropp, J.R. 1995. "Evaluations of Byproducts by Treatment of Groundwaters with Ultraviolet Irradiation." AWWARF and AWWA, Denver, CO.
- Murov, S.L. 1973. *Handbook of Photochemistry*. Marcel Dekker, New York, NY.
- NSF. 1991. *NSF Standard 55: Ultraviolet Water Treatment Systems*. NSF, Ann Arbor, MI.
- Qualls, R., Flynn, M., and Johnson, J. 1983. "The Role of Suspended Particles in Ultraviolet Disinfection." *J. Water Pollution Control Fed.* 55(10):1280-1285.
- Rice, E.W., and Hoff, J.C. 1981. "Inactivation of *Giardia lamblia* Cysts by Ultraviolet Irradiation." *Appl. Environ. Microbiol.* 42:546-547.
- Scheible, O.K., and Bassell, C.D. 1981. *Ultraviolet Disinfection of a Secondary Wastewater Treatment Plant Effluent*. EPA-600/2-81-152, PB81-242125, USEPA, Cincinnati, OH.
- Scheible, O.K. 1983. "Design and Operation of UV Systems." Presented at Water Pollution Control Federation Annual Conference, Cincinnati, OH.
- Slade, J.S., Harris, N.R., and Chisholm, R.G. 1986. "Disinfection of Chlorine Resistant Enteroviruses in Ground water by Ultraviolet Radiation." *Water Sci. Technol.* 189(10):115-123.

- Snicer, G.A., Malley, J.P., Margolin, A.B., and Hogan, S.P. 1996. "Evaluation of Ultraviolet Technology in Drinking Water Treatment." Presented at AWWA Water Quality Technology Conference, Boston, MA.
- Snider, K.E., Darby, J.L. and Tchobanoglous, G. 1991. *Evaluation of Ultraviolet Disinfection for Wastewater Reuse Applications in California*. Department of Civil Engineering, University of California, Davis.
- Sobotka, J. 1993. "The Efficiency of Water Treatment and Disinfection by Means of Ultraviolet Radiation." *Water Sci. Technol.* 27(3-4):343-346.
- Tchobanoglous, G. and Burton, F.L. 1991. *Wastewater Engineering*. McGraw-Hill Inc., New York, NY.
- Tchobanoglous, G.T. 1997. "UV Disinfection: An Update." Presented at Sacramento Municipal Utilities District Electrotechnology Seminar Series. Sacramento, CA.
- USEPA. 1996. *Ultraviolet Light Disinfection Technology in Drinking Water Application – An Overview*. EPA 811-R-96-002, Office of Ground Water and Drinking Water.
- USEPA. 1986. *Design Manual: Municipal Wastewater Disinfection*. EPA/625/1-86/021, Office of Research and Development, Water Engineering Research Laboratory, Center for Environmental Research Information, Cincinnati, OH.
- USEPA. 1980. *Technologies for Upgrading Existing and Designing New Drinking Water Treatment Facilities*. EPA/625/4-89/023, Office of Drinking Water.
- Von Sonntag, C., and Schuchmann, H. 1992. "UV Disinfection of Drinking Water and By-Product Formation – Some Basic Considerations." *J. Water SRT-Aqua*. 41(2):67-74.
- White, G.C. 1992. *Handbook of Chlorination and Alternative Disinfectants*. Van Nostrand Reinhold, New York, NY.
- Wolfe, R.L. 1990. "Ultraviolet Disinfection of Potable water." *Environ. Sci. Tech.* 24(6):768-773.
- Yip, R.W., and Konasewich, D.E. 1972. "Ultraviolet Sterilization of Water- Its Potential and Limitations." *Water Pollution Control (Canada)*. 14:14-18.

Definition of Terms

“Applicant” means a municipality, utility district, authority, corporation or person for whom the water supply improvement work is to be designed, constructed or operated.

“BOD” means the total 5-day biochemical oxygen demand, which is the amount of oxygen required to stabilize biodegradable organic matter under aerobic conditions within a five-day period in accordance with the latest edition of Standard Methods.

“Combined Sewer System” means a sewerage system which carries both sanitary sewage and/or industrial wastes and storm water or drainage.

“CT disinfection” means the product of the residual disinfectant concentration (C) and the contact time (T).

“Dissolved Oxygen” means a measure of the free oxygen in water or effluent.

“Effluent” means any liquid discharged from any unit of wastewater treatment works, or from a sewer.

“Engineer” means the professional person or firm, which designed the sewage and/or water, works and conceived, developed, executed or supervised the preparation of the plan documents.

“Permit to Construct” means a permit issued by the Minister under *Section 36(1) or 37(1)* of the *Water Resources Act*.

“Permit to Operate” means a permit issued by the Minister under *Section 38(1) or 38(2)* of the *Water Resources Act*.

“Pollution” means any alteration of the physical, chemical, biological, or aesthetic properties of the air, soil or waters of the province, including change of temperature, taste or odour, or the addition of any liquid, solid, radioactive, gaseous, or other substance to the air, soil or waters which will render, or is likely to render the air, soil or waters of the province harmful to the public health, safety, or welfare, or harmful, or less useful for domestic, agricultural, industrial, power, municipal, navigational, recreational, or other lawful uses, or for animals, birds or aquatic life.

“Primary Treatment” means treatment for the physical removal of settleable or floatable materials from a wastewater. Primary treatment of a wastewater may also include adjustment of pH and equalization of flow.

“Secondary Treatment” means a method of waste treatment beyond primary treatment where pollutants in solution or in the colloidal state are biologically or chemically removed. The minimum treatment required under this method shall be the removal of at least 85% of the BOD and suspended solids, unless intermediate treatment is deemed to be permissible by the Department.

“Suspended Solids (SS)” means substances such as erosion silt, organic and tritus, plankton, and sand, which are held in suspension in water.

List of Acronyms

AEP – Association of Environmental Professionals
ANSI – American National Standards Institute
ASCE – American Society of Civil Engineers
ASME – American Society of Mechanical Engineers
ASTM – American Society for Testing and Materials
AWWA – American Water Works Association
CSA – Canadian Standards Association
DCS – distributed control systems
DNA – deoxyribonucleic acid
DO – dissolved oxygen
GCDWQ – *Guidelines for Canadian Drinking Water Quality*
GAC – granular activated carbon
HAA5 – haloacetic acid
HRT – hydraulic retention time
IAO – Insurance Advisory Organization
MAC – maximum acceptable concentration
MCL – maximum contaminant level
MF – micro filtration
MMI – Man Machine Interface
NSF – National Science Foundation
NTU – nephelometric turbidity units
OHSA – *Occupational Health and Safety Act*
PLC – Programmable Logic Controllers
PTA – packed tower aeration
RNA – ribonucleic acid
SCADA – Supervisory Control and Data Acquisition
SDDS – small diameter distribution system
STEP – septic tank effluent pump
THM – trihalomethane
UF – ultra filtration
USEPA – United States Environmental Protection Agency
UV – ultraviolet
WAS – waste activated sludge