

703C WATER DISTRIBUTION SYSTEM: DISINFECTION
Office of Water Programs
California State University, Sacramento
(1.8 Continuing Education Units)

COURSE DESCRIPTION

Operators taking this course will learn to identify various types of contaminants and contamination sources, and to identify and correct causes of water quality degradation in water mains and storage facilities. Operators will also study how to disinfect new and existing wells, pumps, mains, and storage facilities; calculate chlorine dosage; operate and maintain hypochlorinators and chlorinators; troubleshoot chlorination systems; and conduct a chlorine safety program.

COURSE OUTLINE

703C Water Distribution System: Distribution

The course uses Chapters 1 and 5 and selected appendix sections from OWP's *Water Distribution System Operation and Maintenance* course book.

Chapter 1 - Introduction to Water Distribution

Following completion of Chapter 1, students should be able to:

1. Describe the water supply system and distributions part in it.
2. List the types and sources of water contamination in distribution systems and how to prevent or correct them.
3. Discuss typical job duties of water distribution system operators.

Chapter 5 – Disinfection

Following completion of Chapter 5, students should be able to:

1. Explain the disinfection process using chlorine and hypochlorite.
2. Describe the breakpoint chlorination process.
3. Identify the points of disinfectant application and select the proper dosage.
4. Start up, shut down, troubleshoot, and maintain disinfection equipment and systems.
5. Handle disinfectants safely and develop and conduct a chlorine safety program.

TIME ASSIGNMENT:

Text Pages: The course uses Chapters 4 and 6 and selected appendix sections from *Water Distribution System Operation and Maintenance* (84 pages). The average word count on a page from the training manual is 950 words. Some pages contain tables, graphs, or illustrations to enhance the presentation of information. It is assumed that readers spend equal time studying tables, graphs, and illustrations as they would spend reading the equivalent amount of text. Therefore, each page is assumed to contain the equivalent of 950 words. Accepted average adult reading speed is 200 – 250 words per minute. Therefore, each page requires four minutes of student time for each reading.

Web screens (local): The course web pages function as the “instructor” for the course. The pages contain topic introduction and description material and they provide instructions for reading assignments, links to supporting web pages, interactive student exercises, video clips, quizzes, glossaries, and the final exam. In this analysis, local web pages are distinguished from supporting (or linked) web pages for accounting purposes only. Students will utilize local and linked web pages seamlessly as they progress through the course.

Local web screens consist of the home page (1), course instruction and help pages (8), content pages (37), student tools pages (5), glossary pages (25), quiz pages (2), and final exam page (1).

Web screens (linked): Linked web resources are an integral part of the course and students are expected to utilize these linked resources extensively as part of their training. Examples of linked resources are the websites for the U. S. EPA Public Drinking Water Systems Programs, the U.S. EPA Drinking Water Standards, the Chlorine Chemistry Council, Corrosion Doctors, and Chemtrec. Each of these sites contains many internal and external links that lead to a plethora of resource information. To be conservative in the count of linked web screens, only the web pages directly linked from the course content pages and the first level linked pages from those directly linked pages will be counted. Subsequent linked pages will not be counted although it is expected that many students will explore and study the information contained on those subsequent links. The projected average amount of time spent per web page is one minute. The total number of linked pages in the course is 120.

Interactive exercises: The interactive math exercises in this course generate a new problem every time they are opened. Therefore, each interactive math exercise can present an unlimited number of unique problems. For conservative quantification purposes, it will be assumed that each interactive math exercise will be called three times each during a course. The non-math interactive exercises are projected to be accessed once per course. Each interactive exercise is projected to take two minutes time. There are 14 interactive exercises in the course. Eight (8) of those interactive exercises are math type, which, if called upon to generate three unique problems each, create 24 interactive exercises. The total number of interactive exercises is 30.

Math problems: The course contains 24 water distribution math problems. Projected average time to solve each math problem is three minutes.

Review questions: The course contains 80 interactive review questions. Each review question requires a written response consisting of one or more sentences. Projected average review question time is two minutes per question.

Discussion questions: The course contains 23 discussion questions. Each discussion question requires a written response consisting one or more sentences. Projected average discussion question time is two minutes per question.

Objective test questions: The course contains 98 objective test questions. Projected average question time is one minute per question.

Video: The course contains 10 minutes of video. Projected viewings: one.

Final exam: The final exam consists of 82 questions. Projected average exam question time is one minute per question.

Component	Minutes per Component Unit	Number of Component Units	Time to Complete Units
Text pages	4	84	336
Web screens (local)	1	73	73
Web screens (linked)	1	120	120
Interactive exercises	2	30	60
Math problems	3	24	72
Review questions	2	80	160
Discussion questions	2	23	46
Objective test questions	1	98	98
Video (minutes)	1	10	10
Exam questions	1	82	82
Total (minutes)			1057
Total (hours)			17.6