

**703D WATER DISTRIBUTION SYSTEM: OPERATION AND MAINTENANCE**  
**Office of Water Programs**  
**California State University, Sacramento**  
(1.8 Continuing Education Units)

**COURSE DESCRIPTION**

This course teaches operators to develop and conduct a water distribution system surveillance program, a water quality monitoring program, and a cross-connection control program. Operators will learn how to locate and repair buried pipes and leaks, make pipe connections, flush and clean pipes, thaw frozen pipes and hydrants, test and read meters, disinfect mains and storage facilities, and conduct effective recordkeeping. In addition, operators completing this course should also be able to respond to emergencies, deal with the public, perform landscape maintenance around facilities, and safely operate and maintain a water distribution system.

**COURSE OUTLINE**

**703D Water Distribution System: Operation and Maintenance**

The course uses Chapter 4 and selected appendix sections from OWP's *Water Distribution System Operation and Maintenance* course book.

**Chapter 4 – Operation and Maintenance**

Following completion of Chapter 4, students should be able to:

1. Develop and conduct programs for water distribution system surveillance, water quality monitoring, and cross-connection control.
2. Locate and repair buried pipes and leaks.
3. Make pipe connections and flush and clean pipes.
4. Manage pipe lining jobs, thaw frozen pipes and hydrants, test and read meters, and disinfect mains and storage facilities.
5. Develop a recordkeeping system and keep accurate records.
6. Train operators to prepare for and respond to emergencies, deal with the public, maintain the distribution system facilities, and safely operate and maintain a water distribution system.

## TIME ASSIGNMENT

**Text Pages:** The course uses Chapter 5 and selected appendix sections from *Water Distribution System Operation and Maintenance* (111 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 (33), student tools pages (5), glossary pages (25), quiz pages (1), 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 American Backflow Prevention Association, and selected pipe associations (Ductile Iron, American Concrete, and Uni-Bell PVC). 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 157.

**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 13 interactive exercises in the course. Seven (7) of those interactive exercises are math type, which, if called upon to generate three unique problems each, create 21 interactive exercises. The total number of interactive exercises is 27.

**Math problems:** The course contains 20 water distribution math problems. Projected average time to solve each math problem is three minutes.

**Review questions:** The course contains 103 interactive review questions. Each review question requires a written response consisting one or more sentences. Projected average review question time is two minutes per question.

**Discussion questions:** The course contains 30 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 60 objective test questions. Projected average question time is one minute per question.

**Video:** The course contains 75 minutes of video. Projected viewings: one.

**Final exam:** The final exam consists of 72 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	111	444
Web screens (local)	1	74	74
Web screens (linked)	1	157	157
Interactive exercises	2	27	54
Math problems	3	20	60
Review questions	2	103	206
Discussion questions	2	30	60
Objective test questions	1	60	60
Video (minutes)	1	75	75
Exam questions	1	72	72
<b>Total (minutes)</b>			<b>1,262</b>
<b>Total (hours)</b>			<b>21.0</b>