



Collection System Maintenance Candidate Handbook

CSM CERTIFICATION

CWEA

TECHNICAL
CERTIFICATION
PROGRAM

v2025.01

cert.cwea.org

Collection System Maintenance Candidate Handbook

Version 2025.01

Congratulations on pursuing certification. Certification is a great way to demonstrate competency, show commitment to the profession, and help with job advancement.

This handbook contains information about California Water Environment Association's Technical Certification Program for certification candidates. Please read this entire handbook to become familiar with CWEA's certification policies and procedures. Certification candidates are responsible for knowing the contents of this handbook. Please contact the CWEA office at (510) 382-7800 with any questions.

All policies are subject to change. The most recent edition of this handbook can be downloaded for free on Cert.CWEA.org. Candidates should ensure that they have the most current version as indicated by the date in the title above.

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INTRODUCTION TO THE TECHNICAL CERTIFICATION PROGRAM

CWEA's Technical Certification Program (TCP) develops and administers competency-based certification exams for wastewater professionals in a number of different vocations. The certification program was founded in 1937. The first certification offered was the Wastewater Treatment Plant Operator certification, which was later adopted by the State Water Board. The exams are developed and revised by CWEA Subject Matter Experts under the guidance of exam development professionals. The certifications continue to grow and be refined in accordance with water sector and certification professional practices. Exams are offered throughout the year and are experience based, ranging from entry level to upper management.

CWEA currently certifies over 7,000 individuals. Certification is a great way to demonstrate competency, show commitment to the water profession, and help with job advancement.

TECHNICAL CERTIFICATION PROGRAM Executive Committee

The Technical Certification Program Executive Committee is the governing body of CWEA's certification program. It was created to develop and implement a multilevel technical certification program for individuals employed in the wastewater field. They are responsible for the development and administration of the Technical Certification Program, including the application, examination development, examination administration, and certification renewal process. They develop the guidelines, criteria, and testing procedures that are responsive to the needs of the water quality industry and allow participants to demonstrate technical competence. They are also responsible for maintaining the quality of the examinations through continuous upgrading and review.

For current Committee members, contact the CWEA office.

Overview of the Certification Process

To become certified all applicants must complete the following requirements:

1. Submit an application
2. Pay the application fee
3. Meet the minimum qualifications regarding professional experience
4. Pass the exam

Once an applicant successfully completes the requirements, they will be mailed their certificate. In order to maintain the certification once earned, certified individuals must continue to meet the following recertification requirements:

1. Submit 12 contact hours of continuing education every two years
2. Pay the annual renewal fee

Certifications Offered by CWEA

- Collection System Maintenance, Grades 1-4
- Mechanical Technologist, Grades 1-4
- Electrical & Instrumentation, Grades 1-4
- Laboratory Analyst, Grades 1-4
- Environmental Compliance Inspector, Grades 1-4
- Advanced Water Treatment Operator, Grades 3-5
 - Offered in partnership with California-Nevada Section of the American Water Works Association. For more information visit www.AWTOperator.org.

Please note that the **Wastewater Treatment Plant Operator Certification** and **Drinking Water Treatment Plant Operator Certification** are administered by the State of California. To work on a drinking water treatment system, distribution system or in a wastewater treatment plant, an individual must have a valid operator certificate or an operator-in-training certificate from the State Water Board. For information about these programs, please contact the [State Water Board Office of Operator Certification](#).

APPLICATION PROCESS

Submitting an Application

Candidates must submit an application and be approved before they can schedule an exam. Applications can be faxed, emailed or mailed to the CWEA office at any time throughout the year. Applications are reviewed by CWEA TCP Staff and/or Subject Matter Experts. Once the application is processed, candidates are notified of their approval status via email. Please follow all instructions on the application carefully. Incomplete applications may delay approval. The application is available on the Cert.CWEA.org website.

Application Deadlines and Exam Windows

The year is divided into four exam windows, each with an application deadline. Applications are valid for one year from the first date of the applicant's original exam window. Applicants may transfer exam windows throughout the year, for details see *Transferring Exam Windows* (p. 15).

Exam Windows	Exam Dates	Application Deadlines
FALL	October 1 st – December 31 st	August 31 st
WINTER	January 1 st – March 31 st	November 30 th
SPRING	April 1 st – June 30 th	February 28 th
SUMMER	July 1 st – September 30 th	May 31 st

CWEA Application Fees

Current fees are listed on the application. Valid CWEA members qualify for a discounted member rate. The non-member rate includes a one-year CWEA membership. If an applicant does not wish to take advantage of the membership, they must note it on the application. The application fee includes a \$50 admin fee, which is non-refundable.

Minimum Qualifications: Qualifying Education and Experience

Applicants must meet the minimum qualifications for the exam at the time the application is submitted. The table below gives the combinations of education and/or experience that will satisfy the requirements. There is no education or experience requirement to take any Grade 1 exam, however, the Grade 1 exams test at the level of one year of experience in the field. Education and experience should be relevant to the vocation and reflect the job knowledge for that grade level. Relevancy is at the sole discretion of CWEA. Applicant's experience must be indicated on the application under "Job Duties". Applicants should provide sufficient detail to demonstrate they possess the relevant experience. The best way to provide this information is to include the official job description for the position. Applicants consent to a thorough investigation of employment records and other qualifications in related activities for the purpose of verification of qualifications. CWEA may verify job history by contacting employers.

CSM Certification Minimum Qualifications Chart

GRADE 1	<ul style="list-style-type: none"> No experience required (1 year of experience in the vocation is recommended)
GRADE 2	<ul style="list-style-type: none"> 2 years of experience in the vocation
GRADE 3	<ul style="list-style-type: none"> CSM Grade 2 certification in good standing 4 years of experience in the vocation OR 3 years with a bachelor's degree or a water/wastewater associate degree
GRADE 4	<ul style="list-style-type: none"> CSM Grade 3 certification in good standing 6 years of experience in the vocation OR 5 years with a bachelor's degree or a water/wastewater associate degree 1 year experience supervising others in the vocation, crew lead experience qualifies

Application Approval

Once an application has been approved, the applicant will receive a Certification Application Approval Notification via email. It is very important that applicants use a current email address when filling out the application. CWEA will only contact applicants in regard to their application status via email. The Certification Application Approval Notification will contain the certification exam the applicant has been approved for, the exam window and CWEA ID number. This ID number is needed when contacting Pearson VUE to schedule an exam appointment.

Rejected Application

Applications will be rejected if applicants do not meet all requirements at the time they apply. CWEA will refund the application fee minus a \$50 admin fee. Refunds are automatically issued within two weeks of rejection to the original form of payment. Candidates may request that their rejected application be reviewed by the Technical Certification Program Executive Committee by submitting a request in writing to tcpcommittee@cwea.org.

Code of Ethics

All CWEA certification holders and applicants are expected to meet the following standards of professional conduct and ethics:

1. To protect public health, themselves, their co-workers, property, and the environment by performing the essential duties of the CWEA certified vocation safely and effectively, and complying with all applicable federal, state and local regulations.
2. To represent themselves truthfully and honestly throughout the entire certification process.
3. To adhere to all test site rules and make no attempt to complete the test dishonestly or to assist any other person in doing so.
4. To refrain from activities that may jeopardize the integrity of the Technical Certification Program.

The CWEA Code of Ethics establishes basic values and standards of conduct for certification applicants and certification holders. Any action of a certification holder or applicant that compromises the reliability of the certification process may be subject to the process described by the Ethics Procedures.

The Ethics Procedures provide a fair process for dealing with ethics complaints. The procedures define the participants in an ethics case and how each case will be handled. Individuals going through the process will be given opportunities to defend themselves and appeal any decisions made. The Ethics Officer handles all official ethics complaints and determines if there is enough merit in each case to follow through with the procedures. If appropriate, the Ethics Officer may suggest mediation to resolve ethics disputes without the formality of going through the entire procedural process. This information is paraphrased for clarity from the 05-01 CWEA Code of Ethics and Ethics Procedures.

A full copy of the policy can be requested by contacting the TCP department.

Some examples of violations would be:

- Providing false work history on an application
- Using prohibited reference materials during a test
- Taking test materials from a test site
- Falsifying documentation of continuing education contact hours

Any action that might undermine CWEA's process of certifying basic minimal competency will be investigated.

Non-Discrimination Policy

CWEA does not discriminate among applicants on the basis of age, gender, race, religion, national origin, disability, sexual orientation or marital status.

Accommodations

In compliance with the Americans with Disabilities Act, reasonable accommodations will be provided for those individuals who provide CWEA with a physician's certificate, or its equivalent, documenting a physical or psychological disability that may affect the individual's ability to successfully complete the certification examination. Written requests for reasonable accommodations must be submitted with the application.

Language barriers and lack of familiarity with computers are not covered under ADA laws.

Privacy

CWEA is committed to protecting privacy. Exam results and any other information regarding an application are confidential and will only be released to the applicant. Basic certification information is available on our [Certification Registry](#). Employers can use the registry to verify an individual's certification status.

Out-of-State Programs

Anyone anywhere in the United States can apply for CWEA certification. Our certifications are specific to the state of California.

CWEA partners with the following water environment associations to administer certification exams for their members:

- Hawaii Water Environment Association
- Michigan Water Environment Association

Candidates wishing to earn certification through one of those associations should be sure to use the correct application that is specific to that association.

Reciprocity

CWEA does not grant certification by reciprocity. For other certification programs that do offer reciprocity, CWEA will provide any information necessary for verification upon request.

SCHEDULING AN EXAM

Scheduling an Exam Appointment

Once an applicant receives the approval notification email, they will be eligible to schedule an exam appointment. Applicants can schedule an exam appointment through [Pearson VUE's website](#) by creating an account or by logging into an existing account. The applicant's CWEA ID number is needed when creating an account. The CWEA ID number can be found in the approval notification email. To schedule an appointment over the phone, call Pearson VUE at

888-749-3881. Test centers are conveniently located throughout the U.S. Locations and can be found on Pearson VUE's website.

Online Proctored Exams

Online proctoring is available for CWEA exams. If available, candidates will be notified in their approval email of the option to schedule their exam online versus at an in-person test center. Candidates should examine both options before making the choice that is best for them. Candidates will make their selection at the time when they schedule their exam.

Online proctored exams are a convenient way to take an exam at home or at work. Candidates will complete a check in process and are monitored online by a live proctor. **An onscreen calculator and white board are provided, no physical calculators or scratch paper are allowed.**

For more information about the online proctored experience, please see: <https://www.pearsonvue.com/us/en/cwea/onvue.html>. Please review the system requirements and Pearson Vue policies and procedures for online proctored exams before you schedule your appointment. You will be required to accept and comply with these policies.

To take an online proctored exam, candidates must meet the system requirements. If a candidate is testing at work, they should check with their Network Administrator or IT Professional that their system meets the requirements.

It is the candidate's responsibility to ensure they meet the system requirements prior to their appointment time. If a candidate does not meet the system requirements, they will not be able to complete their exam and will need to reschedule. This will be considered a No Show and will result in an \$85 No Show fee. Candidates must pay the No Show fee before they can schedule a new test appointment.

Canceling an Existing Appointment

To cancel an appointment, applicants must notify Pearson VUE 24 hours before their scheduled appointment time. Failure to notify Pearson VUE at least 24 hours before the existing appointment will result in an \$85 No Show fee. Pearson VUE will send applicants a Cancellation Confirmation to the email on file in their Pearson VUE account.

The following are considered No Shows and will result in an \$85 No Show fee:

- Failing to appear at a scheduled test appointment
- Failing to check-in for an online appointment

- Arriving at the test center without a current, government-issued photo ID
- Arriving at the test center 15 minutes or later to a scheduled test appointment

Applicants must pay the No Show fee to schedule a new test appointment. Applicants should contact the CWEA office to reschedule.

Rescheduling an Exam Appointment

To reschedule an existing appointment within the same exam window, applicants must call Pearson VUE directly at least 24 hours before their existing exam appointment, for details see *Canceling an Existing Appointment* (p. 14).

Applicants must contact the CWEA office to reschedule (transfer) an existing exam appointment to a different exam window. Before contacting CWEA, the applicant must cancel their existing appointment.

Transferring Exam Windows

Applications are valid for one year from the first date of the applicant's original test window. Applicants may transfer exam windows throughout the year. The first transfer is complimentary, subsequent transfers are \$50.

Applicants can request a transfer at any time. If an applicant does not test by the last date of their original exam window, CWEA will automatically initiate a transfer and the applicant will be notified via email.

PREPARING FOR THE EXAM

Collection System Maintenance Certification Scope

Specifications	Grade 1	Grade 2	Grade 3	Grade 4
Brief description of the Grade Level in relation to the job family.	Entry and basic working level.	Skilled or journey level.	Lead/advanced technical level.	Program manager level.
Level of knowledge, skill and ability within the job family, in relation to job tasks, including the taxonomic level of knowledge applied on the job.	Basic knowledge and ability, as needed to safely and effectively perform basic tasks. This includes: recall and recognition, comprehension, and application.	Knowledge and ability to safely and effectively accomplish most technical tasks in the job family. This includes: comprehension, application, and analysis.	Knowledge, skill and ability to safely and effectively accomplish and coordinate complex tasks. This includes: application, analysis and synthesis.	Knowledge, skill and ability to administer, coordinate and manage complex programs across vocations. This includes: analysis, synthesis, and evaluation.
Level of supervision received.	Receives direct supervision.	Receives limited supervision.	Receives general direction.	May receive broad direction.
Level of supervision exercised.	None.	May provide technical direction over other staff.	Will oversee and direct complex tasks performed by others.	Will coordinate program activities within or across vocations.
Level of training provided to other personnel.	None.	May train lower level personnel.	May oversee a training program.	Designs and administers training programs within the job family.
Use of tools.	Will recognize the basic tools of the job family.	Will be able to apply most of the tools used by those in the job family.	Will select tools for individuals and teams in relation to specific problems.	Manages and evaluates systems and facilities.

Specifications	Grade 1	Grade 2	Grade 3	Grade 4
Problem solving and troubleshooting responsibilities.	Follows directions.	Troubleshoots and solves common problems.	Troubleshoots and solves complex problems.	Evaluates program effectiveness and takes corrective actions as needed.
Actions in relation to safety problems.	Recognizes unsafe conditions.	Recognizes and corrects unsafe conditions.	Anticipates and prevents unsafe conditions.	Designs and administers safety programs.
Actions in relation to standard operating procedures (SOPs), laws and regulations.	Has the ability to follow SOPs.	Has the ability to understand and apply SOPs, laws and regulations.	Formulates new SOPs, in compliance with laws and regulations.	Assures program compliance with laws and regulations.
Actions in relation to documentation of work activities.	Completes minimal work process documentation.	Completes routine work process documentation.	Responsible for detailed technical report writing and review.	Responsible for quality assurance of program documentation.

Exam Content

CWEA's Technical Certification Program Collection System Maintenance exams are based on exam blueprints that outline the exam content and are periodically reviewed by CWEA Subject Matter Experts. An exam blueprint is based on a job task analysis that includes research of the essential duties of a Collection System Maintenance worker at a representative cross-section of systems and facilities in California. The Collection System Maintenance Certifications were last reviewed by Subject Matter Experts in 2025.

The exam content outline that follows presents content covered on the Collection System Maintenance exams and shows the amount of the exam devoted to each Domain in the column labeled weighting.

CSM GRADE 1 EXAM CONTENT OUTLINE

Content Domain	Weighting
Domain 1 – Collection System Operations and Maintenance	28%
Domain 2 – Collection System Tools and Equipment	20%
Domain 3 – Collection System Mapping	5%
Domain 4 – Safety and Regulations	26%
Domain 5 – Administration of Collection Systems	11%
Domain 6 – Math for Collection Systems	10%
Total	100%

Domain 1: Collection System Operations and Maintenance

Sub-Domain 1.1:

Maintenance of Gravity Systems

1. Know the basics of mechanical cleaning (e.g., rodding machine, root saw, chain flail, balling, bucket machine) used for gravity systems maintenance
2. Know the basics of hydraulic cleaning used for gravity systems maintenance
3. Know the principles of root control
4. Maintain manholes, catch basins, laterals and gravity sewers
5. Know basic condition assessment techniques (e.g., CCTV, push cam, pole cam, visual observation)

Sub-Domain 1.2:

Repair of Gravity Systems

1. Locate damaged sections of sewer lines and sewer lateral lines
2. Identify the severity of system damage
3. Assist in determining materials required to make repairs
4. Know basics of excavation and site preparation
5. Know the importance of trenching and shoring techniques

6. Perform basic pipe repair (i.e., cut various pipe materials to length, install couplings, torque couplings)

Sub-Domain 1.3:**Operation, Maintenance, and Repair of Pumps and Force Mains**

1. Know methods used to remove (e.g., rigging, hand signals) and repair pumps
2. Operate pumps to remove sewage from damaged or clogged lines, in response to spills, or when bypass pumping is required
3. Know methods used to clean pumps, lift/pump stations, and wet wells
4. Know basic pump types, piping, and components

Sub-Domain 1.4:**Spills and Emergency Response**

1. Possess general knowledge of your agency's emergency response plan
2. Know containment methods
3. Know clean-up methods and procedures
4. Follow appropriate procedures as the first responder to the spills
5. Identify categories of spills
6. Possess general knowledge of Statewide General Waste Discharge Requirements (WDR) for sanitary sewer systems
7. Possess general knowledge of Sewer System Management Plan (SSMP) requirements per the WDR

Domain 2: Collection System Tools and Equipment

Sub-Domain 2.1:**Equipment for Inspection**

1. Understand how CCTV equipment is used to inspect and assess conditions of collection system
2. Know common locating equipment
3. Know equipment used for physical testing methods (e.g., smoke testing, dye testing)

Sub-Domain 2.2:**Tools and Equipment for Maintenance and Repair**

1. Operate and maintain vehicles and heavy equipment

2. Operate and maintain shoring equipment
3. Operate and maintain hand and power tools
4. Report the need for vehicle and equipment repairs
5. Operate tools that are utilized for clearing vegetation
6. Understand the hazards and use of pneumatic plugs

Domain 3: Collection System Mapping

Sub-Domain 3.1:

Sewer System / Collection System Maps workers and the public

1. Read and interpret system maps, digital / GIS and printed, for collection and drainage systems
2. Identify discrepancies in system / collection maps

Domain 4: Safety and Regulations

Sub-Domain 4.1:

Safety Policies and Procedures

1. Perform all work in accordance with established safety policies and procedures
2. Participate in activities with employees and the public to adhere to safety policies and procedures
3. Recognize and report safety violations
4. Know industry-relevant Cal-OSHA safety rules and procedures
5. Identify common hazards on the job site (e.g., easement hazards, hazards on private property, etc.)
6. Know lockout / tagout procedures

Sub-Domain 4.2:

Confined Space Entry

1. Identify the characteristics of a confined space, including permit required confined space
2. Perform all work in accordance with Cal-OSHA regulations relating to confined space entry, including use of appropriate PPE
3. Recognize correct procedure to safely enter and perform required duties in confined spaces, (e.g., removing manhole cover, retrieval procedures, etc.)
4. Assist with confined space entries as an entrant and attendant

5. Use equipment to determine concentration of hazardous gases and oxygen deficiencies in confined spaces

Sub-Domain 4.3:**Underground Service Alert (USA 811)**

1. Understand basics of Underground Service Alert (e.g., colors, etc.)
2. Understand the basics of underground utility conflicts
3. Mark and notify Underground Service Alert for location of all utilities within work area

Sub-Domain 4.4:**Traffic Control Practices and Requirements**

1. Know applicable laws and regulations regarding traffic control (i.e., MUTCD)
2. Set up traffic control and barricade equipment
3. Understand the appropriate PPE related to traffic control
4. Effectively use advance warning signs, stop/slow paddles, flags, and temporary traffic control zones

Sub-Domain 4.5:**Trenching and Shoring**

1. Know trenching methods (e.g., benching and sloping) based on worksite conditions
2. Know regulations related to trenching and shoring
3. Identify trench protection devices (e.g., whalers, timber shoring, etc.)

Sub-Domain 4.6:**Hazardous Materials / First Aid**

1. Know safety equipment, PPE, and practices related to the handling of hazardous chemicals
2. Identify hazardous materials and proper disposal methods using Safety Data Sheet (SDS)
3. Know about bloodborne pathogens
4. Know precautions to protect against heat-related illness

Domain 5: Administration of Collection Systems

Sub-Domain 5.1:

Records, Reports, and Documentation

1. Maintain accurate and complete records and documentation of work performed
2. Note and report on condition of infrastructure (sewer mains, laterals, and manholes)

Sub-Domain 5.2:

Customer Service and Communication

1. Communicate with members of the public and respond to service calls and questions professionally
2. Assist with responses to customer inquiries and complaints regarding sewer spills and stoppages, sewer odors, and repair work
3. Provide the general public with sewer line location, information, and notification of sewer maintenance
4. Work courteously and effectively with the public and with coworkers

Domain 6: Math for Collection Systems

Sub-Domain 6.1:

Basic Math Used in Collection System Maintenance

1. Perform basic unit conversions
2. Measure distance
3. Calculate area
4. Calculate volume
5. Calculate flow rate
6. Calculate elevation
7. Complete basic spill-related calculations

Suggested References

CWEA’s exam is based on a job task analysis that includes research of the essential duties of a Collection System Maintenance worker at a representative cross-section of systems and facilities in California. CWEA’s exams do not correspond directly to any specific textbook, educational course, or program; instead, the exams are based on an analysis of the duties commonly performed in actual practice. In developing the exam, CWEA Subject Matter Experts used their years of experience in the field along with the key textbooks and reference materials listed below. Candidates should understand that the references listed do not necessarily cover all exam content. Candidates who meet the minimum qualifications for this exam may find these suggested references useful when preparing for this exam; however, these suggested references are not required reading and should not be interpreted as constituting the sole source of all exam questions.

This list does not include all the available textbooks and materials for studying for this exam. Candidates are strongly encouraged to seek additional material, training, and experience, especially in content areas for which the candidate is not adequately prepared. Candidates are encouraged to prepare for CWEA certification exams using as many different study materials as possible plus education events and on-the-job training. Candidates are encouraged to develop their own personal study plan based on individual needs and knowledge. Taking our free self-evaluation can help identify strengths and areas to work on.

Domain 1 – Collection System Operations and Maintenance	
Sub-Domain 1.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 2-4, 9-10, 33-51, 229-235, 235-280, 309-319, 323-402, 450-456
Sub-Domain 1.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 142, 190-200, 468-491 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 88-95, 118-121, 136-138, 206-228, 412-422
Sub-Domain 1.3	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 419-420
Sub-Domain 1.4	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 177-190, 162-177, 412-419, 428-468, 518-521 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 16-19, 279-322, 389-395, 504-507

Domain 2 – Collection System Tools and Equipment

Sub-Domain 2.1	<p>Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 263-270, 308-309, 371-372, 488-491</p> <p>Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 105-108, 127, 129-130, 241-245</p>
Sub-Domain 2.2	<p>Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 22-77, 412-463</p> <p>Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 23-24, 250-258, 461-471</p>

Domain 3 – Collection System Mapping

Sub-Domain 3.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 94-134, 177-190
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Domain 4 – Safety and Regulations

Sub-Domain 4.1	<p>Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 89-102, 224-235</p> <p>Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 20-22, 24-29, 118-123, 136-140, 143-163, 168, 174-176, 179-187, 196, 217-218, 222-225, 229-234, 381-395</p>
Sub-Domain 4.2	<p>Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 89-102, 224-235</p> <p>Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 20-22, 24-29, 118-123, 136-140, 143-163, 168, 174-176, 179-187, 196, 217-218, 222-225, 229-234, 381-395</p>
Sub-Domain 4.3	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 178-181, 416-421
Sub-Domain 4.4	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 94-134
Sub-Domain 4.5	<p>Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 177-190</p> <p>Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 18-19</p>

Sub-Domain 4.6	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 190-216
Domain 5 – Administration of Collection Systems	
Sub-Domain 5.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 498-520
Sub-Domain 5.2	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 370-375
Domain 6 – Math for Collection Systems	
Sub-Domain 6.1	<p>Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 500-548</p> <p>Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 498-534</p>

Suggested Reference List

- [Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition, Office of Water Programs](#)
- [Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition, Office of Water Programs](#)
- [State Water Resources Control Board Order WQ 2022-0103-DWQ](#)
- [Notes from the Field: Practical Tips and Best Practices for Collection System Operators](#)

Sample Questions

This section provides sample questions to help applicants become familiar with the exam format and subject matter.

1. Which of the following is the most essential component of a high-velocity cleaner?
 - a. Pump power source
 - b. All-weather tires
 - c. Dual exhaust
 - d. Safety mirrors
2. When is the best time to inspect a lift/pump station?
 - a. After an emergency has occurred
 - b. During an emergency
 - c. When a large piece of equipment needs removed or repaired
 - d. During scheduled preventative maintenance
3. When operating a high-velocity cleaner, which of the following is best to use for routine cleaning?
 - a. A 5% mandrel
 - b. A nozzle suited for the type and size of pipe being cleaned
 - c. An appropriately sized impeller pump in the downstream manhole
 - d. A Parshall flume
4. Maps must include detailed descriptions of the sewers and manholes, but are NOT required to include which of the following?
 - a. Size
 - b. Material
 - c. Slope
 - d. Color
5. How often should collection system maps be updated?
 - a. Once per year
 - b. Whenever there is a change to the system
 - c. When requested
 - d. Once per quarter
6. Which of the following is NOT an element of an Injury and Illness Prevention Program (IIPP)?
 - a. Hazard Correction
 - b. Training and Instruction
 - c. Responsibility
 - d. Transportation

7. A temporary traffic control zone is considered "low speed" below what speed?
 - a. 40 MPH
 - b. 45 MPH
 - c. 50 MPH
 - d. 55 MPH
8. Which of the following situations will require a Class B Commercial Driver's License?
 - a. A vehicle weighing 26,001 pounds with a trailer weighing 11,000 pounds.
 - b. A single vehicle weighing more than 26,000 pounds
 - c. A motorhome or camper greater than 45 feet long.
 - d. Any vehicle with a trailer weighing more than 10,000 pounds.
9. During which of the following inspection steps should you check the vehicle's suspension?
 - a. During the walk around inspection
 - b. While checking the signal lights
 - c. While checking the engine compartment
 - d. When starting the engine
10. Rounding up, how many bags of concrete would be needed to replace a concrete sidewalk measuring 3 feet x 5 feet x 4 inches deep, if each bag yielded 0.60 cubic feet of concrete?
 - a. 3 bags
 - b. 8 bags
 - c. 9 bags
 - d. 100 bags
11. A wet well measures 3 feet x 5 feet x 10 feet and is holding 6 feet of water when it loses power to the pump. The water is rising at a rate of 1 foot every 30 minutes. If the rise in level remains the same, how much time will it take for the level to reach the top of the wet well?
 - a. 1 hour
 - b. 2 hours
 - c. 8 hours
 - d. 11 hours

Answer Key

1. A – Domain 1
2. D – Domain 1
3. B – Domain 1
4. D – Domain 2
5. B – Domain 2
6. D – Domain 3
7. A – Domain 3
8. B – Domain 4
9. A – Domain 4
10. C – Domain 5
11. B – Domain 5

CSM GRADE 2 EXAM CONTENT OUTLINE

Content Domain	Weighting
Domain 1 – Collection System Operations and Maintenance	27%
Domain 2 – Collection System Tools and Equipment	18%
Domain 3 – Plans, Maps, and As-Builts	13%
Domain 4 – Safety and Regulations	20%
Domain 5 – Administration of Collection Systems	12%
Domain 6 – Math for Collection Systems	10%
Total	100%

Domain 1: Collection System Operations and Maintenance

Sub-Domain 1.1:

Maintenance of Gravity Systems

1. Know the methods of mechanical cleaning (e.g., rodding machine, root saw, chain flail) used for gravity systems maintenance
2. Know the methods of hydraulic cleaning used for gravity systems maintenance
3. Know the principles of root control activities
4. Maintain manholes, catch basins, laterals and gravity sewers
5. Know basic methods of odor and vector control in sewer mains, manholes, and lift/pump stations

Sub-Domain 1.2:

Repair of gravity systems

1. Locate damaged sections of sewer lines and sewer lateral lines
2. Assess severity of system damage
3. Determine materials required to make repairs

4. Apply techniques of excavation and site preparation
5. Apply trenching and shoring techniques
6. Perform pipe repair (i.e., cut various pipe materials to length, install couplings, torque couplings)
7. Restore surface (e.g., concrete, asphalt, landscaping) to original condition
8. Basic knowledge of pipe materials, fittings, and pipefitting tools and methods, including pipe bursting and pipe patching / Cure In-Place Piping (CIPP)

Sub-Domain 1.3:

Operation, Maintenance, and Repair of Pumps and Force Mains

1. Recognize existence of agency SCADA systems and basic information available
2. Know about methods used to repair pumps
3. Clean pumps, lift/pump stations, and wet wells
4. Know basic pump types, piping, and components
5. Understand information provided by pump curves

Sub-Domain 1.4:

Spills and Emergency Response

1. Know basic containment methods and how they are performed
2. Perform post-spill clean-up
3. Follow appropriate procedures as the first responder to a spill
4. Know categories of spills
5. Know local and state regulatory notification spill volumes and timeframes
6. Initiate documentation for reporting of spills
7. Know how to set up and operate an emergency bypass

Domain 2: Collection System Tools and Equipment

Sub-Domain 2.1:

Equipment for Inspection

1. Operate CCTV equipment to inspect and assess conditions of collection system
2. Maintain CCTV equipment
3. Perform minor repairs for CCTV equipment
4. Use camera mounted sonde and other locating equipment
5. Record condition data based on CCTV results
6. Operate equipment used for physical testing methods (e.g., smoke testing and dye testing)

Sub-Domain 2.2:**Tools and Equipment for Maintenance and Repair**

1. Operate and maintain vehicles and heavy equipment
2. Operate and maintain trench protection equipment
3. Operate and maintain hand and power tools
4. Identify and communicate the need for vehicle and equipment repairs
5. Understand the hazards and use of pneumatic plugs

Domain 3: Plans, Maps, and As-Builts

Sub-Domain 3.1:**Sewer System / Collection System Maps**

1. Read and interpret system maps, digital / GIS and printed, for collection and drainage systems
2. Communicate corrections to system / collection maps as needed

Sub-Domain 3.2:**Construction plans, Drawings, and Specifications**

1. Interpret construction plans, drawings, and specifications related to collection system projects including underground infrastructure, and related equipment
2. Provide input on schematics, facility record drawings, and known deficiencies in advance of project design

Domain 4: Safety and Regulations

Sub-Domain 4.1:**Safety Policies and Procedures**

1. Perform all work in accordance with established safety policies and procedures
2. Coordinate activities with employees and the public to adhere to safety policies and procedures
3. Enforce safety regulations
4. Know industry-relevant Cal-OSHA safety rules and procedures
5. Identify and correct hazards on the job site (e.g., easement hazards, hazards on private property, etc.)
6. Execute lockout / tagout procedures

Sub-Domain 4.2:**Confined Space Entry**

1. Identify the characteristics of a confined space, including permit-required confined space
2. Perform all work in accordance with Cal-OSHA regulations relating to confined space entry, including use of appropriate PPE
3. Recognize correct procedure to safely enter and perform required duties in confined spaces, (e.g., removing manhole cover, retrieval procedures, etc.)
4. Know responsibilities of the entrant, attendant, and supervisor and demonstrate competence in each role
5. Use equipment to determine concentration of hazardous gases and oxygen deficiencies in confined spaces
6. Understand and comply with the requirements of a Cal-OSHA compliant respiratory protection program
7. Complete confined space entry permits

Sub-Domain 4.3:**Underground Service Alert (USA 811)**

1. Understand Underground Service Alert roles and responsibilities for locations of all utilities within work area
2. Make site ready for work, based on required permits and safe-dig procedures

Sub-Domain 4.4:**Traffic Control Practices and Requirements**

1. Know and apply applicable laws and regulations regarding traffic control (i.e., MUTCD)
2. Use proper traffic control techniques and devices when working in traffic areas
3. Effectively use advance warning signs, stop/slow paddles, flags, and temporary traffic control zones
4. Select and use the appropriate PPE related to traffic control

Sub-Domain 4.5:**Trenching and Shoring**

1. Assess site conditions and apply appropriate trenching methods
2. Ensure compliance with regulations related to trenching and shoring

Sub-Domain 4.6:**Hazardous Materials / First Aid**

1. Know safety equipment, PPE, and practices related to the handling of hazardous chemicals
2. Identify hazardous materials and proper disposal methods using Safety Data Sheet (SDS)
3. Know about bloodborne pathogens
4. Know precautions to protect against heat-related illness

Sub-Domain 4.7:**Environmental Protection Regulations**

1. Understand Statewide General Waste Discharge Requirements (WDR) for sanitary sewer systems
2. Understand the components and the implementation of Sewer System Management Plan (SSMP)
3. Understand regulations which govern illegal connections and illicit discharges

Domain 5: Administration of Collection Systems

Sub-Domain 5.1:**Records, Reports, and Documentation**

1. Maintain accurate and complete records and documentation of work performed
2. Evaluate and report on condition of infrastructure (sewer mains, laterals, and manholes)
3. Maintain records of permit, easement, as-built, and blueprints accurately

Sub-Domain 5.2:**Customer Service and Communication**

1. Interpret agency requirements and communicate them to members of the public
2. Respond to service calls and questions tactfully and professionally
3. Receive, record, respond to, and resolve customer inquiries and complaints regarding sewer spills, sewer odors, and repair work
4. Interact with the general public regarding collection system information and notifications of maintenance activity

Sub-Domain 5.3:

Training

1. Provide training on the proper and safe operation and use of all collection system machinery and equipment
2. Assist with onboarding, training, and providing input on job performance

Sub-Domain 5.4:

Planning and Supervision

1. Participate in the planning and scheduling of crews
2. Verify that all information on work orders is accurate
3. Determine the type of materials, supplies, machinery, and tools to be used for each project, and prepare materials for use

Domain 6: Math for Collection Systems

Sub-Domain 6.1:

Math Used in Collection System Maintenance

1. Calculate gross vehicle weight rating (GVWR)
2. Calculate area
3. Calculate volume
4. Calculate velocity
5. Calculate flow rate
6. Calculate elevation
7. Calculate slope
8. Complete spill-related calculations

Suggested References

CWEA’s exam is based on a job task analysis that includes research of the essential duties of a Collection System Maintenance worker at a representative cross-section of systems and facilities in California. CWEA’s exams do not correspond directly to any specific textbook, educational course, or program; instead, the exams are based on an analysis of the duties commonly performed in actual practice. In developing the exam, CWEA Subject Matter Experts used their years of experience in the field along with the key textbooks and reference materials listed below. Candidates should understand that the references listed do not necessarily cover all exam content. Candidates who meet the minimum qualifications for this exam may find these suggested references useful when preparing for this exam; however, these suggested references are not required reading and should not be interpreted as constituting the sole source of all exam questions.

This list does not include all the available textbooks and materials for studying for this exam. Candidates are strongly encouraged to seek additional material, training, and experience, especially in content areas for which the candidate is not adequately prepared. Candidates are encouraged to prepare for CWEA certification exams using as many different study materials as possible plus education events and on-the-job training. Candidates are encouraged to develop their own personal study plan based on individual needs and knowledge. Taking our free self-evaluation can help identify strengths and areas to work on.

Domain 1 – Collection System Operations and Maintenance	
Sub-Domain 1.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 302-404 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Page 53
Sub-Domain 1.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 412-491
Sub-Domain 1.3	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 439-445 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 65, 81-83, 127-130, 206-234, 243
Sub-Domain 1.4	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 224-229

	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 21, 425-436, 452-453
Domain 2 – Collection System Tools and Equipment	
Sub-Domain 2.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 230-280
Sub-Domain 2.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 89-92, 412-421, 439-445, 457-465
Domain 3 – Plans, Maps, and As-Builts	
Sub-Domain 3.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 22-77, 422-437, 461-471 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Page 23
Sub-Domain 3.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 22-77, 422-437 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Page 23
Domain 4 – Safety and Regulations	
Sub-Domain 4.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 88-217 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 137-138, 389-408
Sub-Domain 4.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 134-177 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 389-395
Sub-Domain 4.3	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 178-181, 416-421
Sub-Domain 4.4	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 94-134
Sub-Domain 4.5	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 177-190

	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 18-19
Sub-Domain 4.6	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 190-216
Sub-Domain 4.7	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 9-16 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 2-7
Domain 5 – Administration of Collection Systems	
Sub-Domain 5.1	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 129-130, 241-243
Sub-Domain 5.2	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 20-22, 365-375
Sub-Domain 5.3	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 350-364, 381-408
Sub-Domain 5.4	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 243-245, 473-477
Domain 6 – Math for Collection Systems	
Sub-Domain 6.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 487- 572

Suggested Reference List

- [Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition, Office of Water Programs](#)
- [Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition, Office of Water Programs](#)
- [State Water Resources Control Board Order WQ 2022-0103-DWQ](#)
- [Notes from the Field: Practical Tips and Best Practices for Collection System Operators](#)

Sample Questions

This section provides sample questions to help applicants become familiar with the exam format and subject matter.

1. When should a hydro jetting nozzle equipped with a chain flail be used?
 - a. When there are many offsets in the pipe joints
 - b. When cleaning dense roots at joints, calcium, or other build-up
 - c. Only when cleaning steel pipe
 - d. Only when in sanitary sewer force mains
2. When bypassing a segment of pipe, you should always put the discharge side of the pump directly into which manhole?
 - a. The next manhole upstream
 - b. The third manhole upstream, skipping two manholes upstream
 - c. The next available manhole downstream
 - d. The third manhole downstream, skipping two manholes downstream
3. What is closed-circuit television (CCTV) equipment used for in collection systems?
 - a. To calculate and regulate flow
 - b. To rehabilitate pipe and manhole structures
 - c. To determine sources of infiltration and the condition of the infrastructure
 - d. To determine depth and the slope of the pipe
4. Which of the following should be used to clear vegetation around a raised manhole?
 - a. A weed whacker
 - b. An excavator
 - c. A controlled burn
 - d. Truck tires
5. Which of the following is NOT information typically included on a paper map?
 - a. Manhole identification numbers
 - b. Flow directions
 - c. Flow conditions
 - d. Pipe material (i.e. VCP, PVC, cast iron)

6. You are looking at plans for an upcoming project for an installation of new sewer lines. Where would you likely find the type of pipe material that will be used for the sewer lines?
 - a. The invoice given to the Contractor from the Supplier
 - b. The Specification Sheet on the plans
 - c. The Agency's Sewer System Management Plan (SSMP)
 - d. Correspondence with the engineering personnel
7. What is the necessary personal protective equipment (PPE) when operating a 90-pound jackhammer?
 - a. Hard hat, long sleeve shirt, pants
 - b. Hard hat, steel toe boots, eye protection, gloves
 - c. Pants, shirt, eye protection
 - d. Eye protection, boots, pants
8. When is an excavation site considered ready for work per 811 Underground Service Alert (USA) DigAlert?
 - a. When the excavator receives a response from all known members within the delineated boundaries and after two working days
 - b. When the excavation site has just been delineated
 - c. When the company or agency contacts the excavator
 - d. When the excavator receives a response from all known members within the delineated boundaries and after one working day
9. How would collection system operators track the tasks performed during their work day?
 - a. By completing tasks in the CMMS (computerized maintenance management system)
 - b. Through automatic GPS (global positioning system) tracking on the fleet vehicles
 - c. Through debriefing with the supervisor
 - d. By clocking in and out of their work day
10. How can a sewer agency ensure that all complaints and inquiries receive prompt attention?
 - a. Have one person respond to complaint and inquiry calls 24 hours a day, seven days a week.
 - b. Develop a standard procedure for receiving and responding to complaints and inquiries.
 - c. Ensure that a supervisor is always available to respond to complaint calls.
 - d. Send newsletters to everyone within the service area to minimize the inquiries.

11. A spill is reported to an agency at 1:10 PM. The crew arrives at the location and breaks the stoppage, ending the spill at 1:30 PM. Using the San Diego manhole overflow picture chart, the SSO appeared to have a flow rate of 5 gallons per minute. What is the estimated overflow volume?
 - a. 5 gallons
 - b. 20 gallons
 - c. 50 gallons
 - d. 100 gallons
12. If your vehicle has a tare weight of 4,500 pounds and the gross vehicle weight is 8,425 pounds, how much weight can be added to the vehicle before it is considered overloaded?
 - a. 2,925 pounds
 - b. 3,425 pounds
 - c. 3,925 pounds
 - d. 4,000 pounds

Answer Key

1. B – Domain 1
2. C – Domain 1
3. C – Domain 2
4. A – Domain 2
5. C – Domain 3
6. B – Domain 3
7. B – Domain 4
8. A – Domain 4
9. A – Domain 5
10. B – Domain 5
11. D – Domain 6
12. C – Domain 6

CSM GRADE 3 EXAM CONTENT OUTLINE

Content Domain	Weighting
Domain 1 – Collection System Operations and Maintenance	21%
Domain 2 – Collection System Tools and Equipment	16%
Domain 3 – Plans, Maps, and As-Builts	13%
Domain 4 – Safety and Regulations	21%
Domain 5 – Administration of Collection Systems	17%
Domain 6 – Math for Collection Systems	12%
Total	100%

Domain 1: Collection System Operations and Maintenance

Sub-Domain 1.1:

Routine Maintenance, Cleaning, and Repair of Collection System

1. Supervise the inspection, maintenance, and repair of sewer lines, storm drain system, lift/pump stations, manholes, and laterals
2. Evaluate, coordinate, and monitor preventive maintenance, root control, and pipe blockage prevention programs (FOG), and make adjustments as necessary
3. Apply advanced knowledge of trenching and shoring methods and techniques
4. Utilize computerized systems to make informed decisions about operation and maintenance (e.g., SCADA, CMMS, GIS, and historical documents)
5. Make assessments related to and supervise the repair or replacement of mains, manholes, and other collection system components
6. Implement methods of odor and vector control in sewer mains and manholes
7. Understand the laws and regulations concerning Underground Service Alert (USA)
8. Apply techniques of excavation and site preparation

9. Perform pipe repair (i.e., cut various pipe materials to length, install couplings, torque couplings)

Sub-Domain 1.2:

Spills and Emergency Response

1. Submit sanitary sewer spill reports on the California Integrated Water Quality System (CIWQS)
2. Report and assist with reporting spills in a timely manner as prescribed by applicable regulations to the proper regulating agency (e.g., Cal-OES)
3. Oversee containment and clean-up of sewer spills
4. Ensure appropriate response to emergency sewer calls
5. Direct emergency response activities including repairs, spills response, storm response, incident command and/or coordination, and EOC support
6. Verify data associated with direct spill response activities
7. Supervise bypass pumping and the implementation of contingency plans

Domain 2: Collection System Tools and Equipment

Sub-Domain 2.1:

Equipment for Inspection

1. Utilize CCTV to resolve rehabilitation, operations and maintenance, and customer service issues
2. Plan, oversee, and direct CCTV program
3. Understand and apply condition assessment standards
4. Evaluate the maintenance needs of CCTV equipment and make recommendations for modifications and/or upgrades

Sub-Domain 2.2:

Tools and Equipment for Maintenance and Repair

1. Advise staff, consultants, engineers, and contractors in acquisition and installation of new equipment
2. Supervise safe vehicle operation, routine maintenance, and repair programs
3. Supervise safe operation and maintenance of trench protection equipment
4. Supervise the safe operation and maintenance of hand and power tools
5. Supervise safe operation and maintenance of equipment used for specialized sewer equipment (e.g., nozzles, smoke tests, etc.)
6. Understand the hazards and use of pneumatic plugs

Domain 3: Plans, Maps, and As-Builts

Sub-Domain 3.1:

Sewer System / Collection System Maps

1. Oversee the use of and recommend updates (red lining) to GIS systems
2. Utilize mapping to plan and route work
3. Evaluate collection system data to make informed decisions

Sub-Domain 3.2:

Construction Plans, Drawings, and Specifications

1. Understand, evaluate, and recommend modifications to construction plans, maps, layouts, piping sketches, drawings, and specifications related to collection system projects, including underground infrastructure and related equipment
2. Provide input to prepare capital improvement projects

Domain 4: Safety and Regulations

Sub-Domain 4.1:

Safety Policies and Procedures

1. Ensure that the Injury, Illness, and Prevention Plan (IIPP) and other safety program requirements (e.g., Cal-OSHA, heat-related illness prevention) are implemented and carried out
2. Identify, investigate, resolve, and document safety incidents, accidents, injuries, and near misses
3. Ensure that the lockout/tagout procedures are followed
4. Understand the hazards associated with collection system operation, maintenance, and repair
5. Assist in the development of the collection system safety policies and procedures

Sub-Domain 4.2:

Confined Space Entry

1. Ensure all work is performed in accordance with Cal-OSHA regulations relating to confined space entry and working around hazardous atmospheres
2. Ensure that all necessary equipment for confined space entry including PPE is available and in good condition

3. Assess equipment needs and make recommendations for replacement and repair
4. Ensure gas monitoring equipment is calibrated and in good working order
5. Oversee the effectiveness of confined space entry team

Sub-Domain 4.3:**Traffic Control Practices and Requirements**

1. Understand California Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) requirements
2. Oversee and evaluate the setup of traffic control devices and direct necessary improvements
3. Ensure the use and replacement of all pertinent personal protective equipment (PPE)

Sub-Domain 4.4:**Safety Regulations**

1. Ensure understanding of hazards and PPE per safety data sheets (SDS) and Right-to-Know laws (i.e., Hazard Communication Standard)
2. Knowledge of pertinent federal, state, and local laws, codes, and regulations
3. Ensure compliance with all applicable safety regulations and procedures

Sub-Domain 4.5:**Environmental Protection Regulations**

1. Understand Statewide General Waste Discharge Requirements (WDR) for sanitary sewer systems
2. Apply comprehensive knowledge of Sewer System Management Plan (SSMP) requirements per the WDR
3. Apply comprehensive knowledge of regulations which govern illegal connections and illicit discharges
4. Provide input into the development, audits, and updates of the SSMP

Domain 5: Administration of Collection Systems

Sub-Domain 5.1:

Records, Reports, and Documentation

1. Prepare and maintain records, forms, and reports for management and regulatory agencies
2. Assist in the preparation of analytical and statistical reports on operations and activities
3. Report on the condition of assets
4. Research and analyze historical maintenance and property records

Sub-Domain 5.2:

Customer Service and Communication

1. Investigate and resolve complaints and claims related to collection system maintenance and repair
2. Coordinate operations with the public and outside agencies
3. Ensure property owners are notified of service interruptions and are provided with information regarding the work being performed
4. Communicate effectively with state and local agencies regarding problems with the collection system
5. Evaluate the effectiveness of the customer service program and make adjustments as necessary

Sub-Domain 5.3:

Training and Supervision

1. Supervise, train, evaluate, and direct personnel
2. Assist in onboarding new personnel
3. Plan, prioritize, assign, and review work of staff responsible for the operation and maintenance of the collection system
4. Provide leadership and technical support, particularly for complex issues
5. Assess safety needs and support the development of training programs
6. Participate in the investigations of violations of employer policies or agency ordinances
7. Coach and mentor employees through constructive and tactful feedback

Sub-Domain 5.4:**Policies and Procedures**

1. Ensure compliance with agency policies and procedures and regulatory requirements
2. Participate in the development of policies and procedures and recommend changes to existing standards and procedures

Sub-Domain 5.5:**Planning, Budgeting, and Data Analysis**

1. Plan, organize, track, and document collection system maintenance and repair activities
2. Assist in the development Key Performance Indicators (KPIs) and ensure KPIs are tracked and met
3. Identify and implement process improvements
4. Utilize the Computerized Maintenance Management System (CMMS) to track, update, and assign work activities
5. Assist with the preparation of the annual budget and work plan
6. Assess program and project resource needs, funding, staffing, equipment, and materials and offer recommendations

Domain 6: Math for Collection Systems

Sub-Domain 6.1:**Math Used in Collection System Maintenance**

1. Calculate gross vehicle weight rating (GVWR)
2. Calculate area
3. Calculate volume
4. Calculate velocity
5. Calculate flow rate
6. Calculate elevation
7. Calculate slope
8. Complete complex spill-related calculations

Suggested References

CWEA's exam is based on a job task analysis that includes research of the essential duties of a Collection System Maintenance worker at a representative cross-section of systems and facilities in California. CWEA's exams do not correspond directly to any specific textbook, educational course, or program; instead, the exams are based on an analysis of the duties commonly performed in actual practice. In developing the exam, CWEA Subject Matter Experts used their years of experience in the field along with the key textbooks and reference materials listed below. Candidates should understand that the references listed do not necessarily cover all exam content. Candidates who meet the minimum qualifications for this exam may find these suggested references useful when preparing for this exam; however, these suggested references are not required reading and should not be interpreted as constituting the sole source of all exam questions.

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Domain 1 – Collection System Operations and Maintenance	
Sub-Domain 1.1	<p>Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 224-296, 302-404</p> <p>Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 118-121, 124-128, 229-234, 412-422, 428-447</p>
Sub-Domain 1.2	<p>Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 224-229</p> <p>Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 21, 25-27, 425-428, 452-453</p>
Domain 2 – Collection System Tools and Equipment	
Sub-Domain 2.1	<p>Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 235-280</p>

	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. 414
Sub-Domain 2.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 89-92, 319-321, 339-346, 349-353, 365-370 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 286-309
Domain 3 – Plans, Maps, and As-Builts	
Sub-Domain 3.1	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 469-471
Sub-Domain 3.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 22-82
Domain 4 – Safety and Regulations	
Sub-Domain 4.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 88-217 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 9-19, 137-140, 381-402, 458-459
Sub-Domain 4.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 134-177 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 389-395, 402-406
Sub-Domain 4.3	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 178-181, 416
Sub-Domain 4.4	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 94-134
Sub-Domain 4.5	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 9-16, 88-216 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 383-388
Domain 5 – Administration of Collection Systems	
Sub-Domain 5.1	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 129-130, 241-243, 449-453
Sub-Domain 5.2	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 22, 373-374, 449

Sub-Domain 5.3	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 356-364, 382-385, 448
Sub-Domain 5.4	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 335, 388-389, 396
Sub-Domain 5.5	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 275-278
Domain 6 – Math for Collection Systems	
Sub-Domain 6.1	<p>Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 501-586</p> <p>Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 487-572</p>

Suggested Reference List

- [Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition, Office of Water Programs](#)
- [Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition, Office of Water Programs](#)
- [State Water Resources Control Board Order WQ 2022-0103-DWQ](#)

Sample Questions

1. Which of the following would most likely involve conducting periodic pump vibration analysis and comparing measurements to known baseline data to forecast failure?
 - a. A corrective maintenance program
 - b. A predictive maintenance program
 - c. A lift/pump life-cycle cost analysis
 - d. A lift/pump station budget forecast
2. What is the most effective method to identify and quantify sewer defects?
 - a. Flow monitoring
 - b. Smoke tests
 - c. Closed-Circuit Television (CCTV)
 - d. Dye tests
3. In general, when should equipment be replaced?
 - a. When new technology becomes available
 - b. When new employees join the utility
 - c. When it has reached the end of its useful life
 - d. When any debt associated with the item has been paid
4. What is the main purpose of using hydraulic equipment for sewer cleaning?
 - a. To prevent blockages and overflows
 - b. To find structural defects
 - c. To minimize infiltration and inflow
 - d. To increase system capacity
5. To retrieve information such as streets, manholes, line segments, and lift stations geographically, what system would be appropriate?
 - a. Remote Terminal Unit (RTU)
 - b. Supervisory Control and Data Acquisition System (SCADA)
 - c. Geographic Information System (GIS)
 - d. Multiple Addressed System - Radio (MAS)
6. Why is it important for operators to be involved during the planning and design phases for construction of a new lift/pump station?
 - a. To inform Project Engineers of issues in existing facilities so that they may be eliminated in the new facility
 - b. To let the governing board know what costs could be expected for maintenance of the new facility
 - c. To project future staffing needs so that hiring and recruitment can begin
 - d. To draft Standard Operating Procedures (SOP) that are applicable to the new lift/pump station

7. Why is it important for employers to identify and investigate a near miss?
 - a. Identifying and investigating near misses is not important.
 - b. Identifying and investigating near misses is a key element to finding and controlling risks after workers are injured.
 - c. Identifying and investigating near misses is a key element to finding and controlling risks before workers are injured.
 - d. Identifying and investigating near misses does not help to determine root causes and hazard mitigation strategies.
8. Which of the following best defines a non-permit confined space?
 - a. Any confined space with a chance of engulfment and does contain a potential hazard capable of causing death or serious physical harm
 - b. A confined space that does not contain or have the potential to contain any atmospheric hazard capable of causing death or serious physical harm
 - c. A confined space needing welding work and other potential dangers may be present in the space
 - d. A confined space that can be entered and exited with a ladder or any type of hoist system that will not change the atmosphere of the space
9. During the construction of a storm drain system, the contractor breaks an 8-inch residential sewer line and sewage is spilling in the excavated trench. Water service needs to be turned off to perform the repair. What information needs to be provided to the residents in the area?
 - a. Estimated work time and inspections
 - b. Explanation of work and time frame
 - c. No notification because it is an emergency
 - d. Supervisor's name and contact information
10. An employee's attendance profile suggests their absences are excessive. Which of the following is the best option you could take as a supervisor to begin correcting this issue?
 - a. Discuss with the employee the way their excessive attendance negatively impacts the group's ability to meet its goals.
 - b. Keep a record of the absences and make sure to note them in the next performance evaluation.
 - c. Work with human resources to begin the progressive discipline process.
 - d. Send a subtle message to the employee by recognizing others in the group for good attendance.

11. In Million Gallons per Day (MGD), what is 0.68 cubic feet per second (cfs)?
 - a. 0.36 MGD
 - b. 0.43 MGD
 - c. 1 MGD
 - d. 1.05 MGD
12. What is the velocity (in feet per second) for a flow of 14.0 cubic feet per second entering a 24 inch diameter mainline?
 - a. 0.22 feet per second
 - b. 3.14 feet per second
 - c. 4.45 feet per second
 - d. 8.91 feet per second

Answer Key

1. B – Domain 1
2. C – Domain 1
3. C – Domain 2
4. A – Domain 2
5. C – Domain 3
6. A – Domain 3
7. C – Domain 4
8. B – Domain 4
9. B – Domain 5
10. A – Domain 5
11. B – Domain 6
12. C – Domain 6

CSM GRADE 4 EXAM CONTENT OUTLINE

Content Domain	Weighting
Domain 1 – Collection System Operations and Maintenance	28%
Domain 2 – Collection System Management	39%
Domain 3 – Safety and Regulations	33%
Total	100%

Domain 1: Collection System Operations and Maintenance

Sub-Domain 1.1:

Preventative/Routine Maintenance, Cleaning, and Repair of Sewer System

1. Plan, direct, coordinate, prioritize, and review the work plan for the collection system
2. Oversee all aspects of the collection system maintenance program and understand how to use performance indicators to evaluate program effectiveness
3. Know practices and procedures related to the installation and repair of sewer mains, laterals, cleanouts, and manholes, including trenching and shoring practices
4. Identify service areas and locations of sewer facilities and equipment
5. Understand the principles of sewer system hydraulic modeling, and capacity assessment and assurance
6. Analyze complex collection system maintenance problems, evaluate alternatives, and direct the courses of action

Sub-Domain 1.2:

Condition Assessment

1. Oversee development and implementation of collection system assessment program

2. Know practices and procedures related to condition assessment of sewer collection system
3. Ensure inspection records are maintained
4. Utilize condition assessment results to prioritize pipeline repairs and to inform the development of capital improvement needs

Sub-Domain 1.3:

Equipment

1. Know the tools, materials, and equipment needed to operate and maintain collection systems
2. Evaluate the methods used to diagnose, disassemble, and repair collection system equipment
3. Develop, implement, oversee, approve, and make recommendations for collection system equipment selection, maintenance, and replacement programs
4. Research and recommend purchase of equipment, parts, suppliers, and costs

Sub-Domain 1.4:

Spills and Emergency Response

1. Evaluate the effectiveness of spill response procedures and practices
2. Certify CIWQS spill reports, including verifying volume estimates
3. Prepare and certify collection system annual report in CIWQS
4. Develop, evaluate, maintain, and update as required the Spill Emergency Response Plan (SERP)
5. Develop and implement contingency plans for emergency bypass

Domain 2: Collection System Management

Sub-Domain 2.1:

Budgeting

1. Oversee, develop, and administer the collection system annual budget
2. Monitor, approve, and analyze expenditures and implement adjustments
3. Prepare and approve purchase requisitions of needed materials and supplies
4. Write specifications and bid solicitations for equipment purchases
5. Track and forecast resources needed for staffing, equipment, materials, and supplies
6. Develop scopes of work to request quotes and proposals

7. Calculate costs related to system maintenance activities

Sub-Domain 2.2:

Management and Planning

1. Evaluate personnel, equipment, and material needs
2. Coordinate with publicly owned treatment works (POTWs) for major repairs, equipment installation, special maintenance activities, and any anticipated flow changes or conditions
3. Know development review and plan checking processes
4. Administer the work of contractors, consultants, and engineers
5. Direct and participate in the development and implementation of collection system goals, objectives, policies, and procedures
6. Oversee the use of GIS mapping systems in collection system operation and maintenance
7. Manage Computerized Maintenance Management System (CMMS) and its use in scheduling, preventative maintenance, repair activities, and purchasing
8. Prepare records, reports, and other written materials
9. Review and respond to liability claims and participate in the investigation of violations of employer policies or agency ordinances
10. Serve as collection system subject matter expert to upper management and prepare/present staff reports
11. Develop Key Performance Indicators (KPIs) and ensure KPIs are tracked and met

Sub-Domain 2.3:

Supervision and Training

1. Assign, evaluate, and supervise the work of collection system personnel
2. Evaluate the completion of delegated duties
3. Know principles and practices of effective leadership and employee supervision, including training and performance evaluation
4. Develop and implement standard operating procedures (SOPs) and business processes
5. Motivate staff and work with employees to achieve performance goals and objectives
6. Implement disciplinary policies and procedures and participate in labor relations activities
7. Develop and maintain the training plan for all collection system personnel
8. Participate in the hiring process

9. Coach and mentor employees through constructive and tactful feedback

Sub-Domain 2.4:

Public Relations and Customer Service

1. Respond to and resolve complex and sensitive public inquiries and complaints in a professional manner
2. Assist in the development of responses to the media
3. Assist in public awareness and outreach programs
4. Direct and support supervisors and staff to ensure quality service delivery
5. Negotiate and resolve collection system issues involving the public and other external partners

Domain 3: Safety and Regulations

Sub-Domain 3.1:

Safety

1. Develop, review, and ensure compliance with all applicable safety procedures (i.e., IIPP, confined space, traffic control, bloodborne pathogens, heat-related illnesses, etc.)
2. Evaluate accidents, violations, or infractions and ensure documentation and reporting to the required entities
3. Develop and administer safety training programs and policies for collection system personnel
4. Ensure traffic safety plans meet the California Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) requirements
5. Develop and implement a safety tailgate program

Sub-Domain 3.2:

Regulations

1. Interpret relevant local, state, and federal laws, regulations, and guidelines associated with the ownership and maintenance of public sewer systems
2. Oversee development, maintenance, and implementation of Sewer System Management Plan (SSMP) requirements
3. Know and ensure compliance with the Statewide Waste Discharge Requirements (WDR) General Order for Sanitary Sewer Systems
4. Know the principles of spill reporting and assure spill volume estimates

Suggested References

CWEA's exam is based on a job task analysis that includes research of the essential duties of a Collection System Maintenance worker at a representative cross-section of systems and facilities in California. CWEA's exams do not correspond directly to any specific textbook, educational course, or program; instead, the exams are based on an analysis of the duties commonly performed in actual practice. In developing the exam, CWEA Subject Matter Experts used their years of experience in the field along with the key textbooks and reference materials listed below. Candidates should understand that the references listed do not necessarily cover all exam content. Candidates who meet the minimum qualifications for this exam may find these suggested references useful when preparing for this exam; however, these suggested references are not required reading and should not be interpreted as constituting the sole source of all exam questions.

This list does not include all the available textbooks and materials for studying for this exam. Candidates are strongly encouraged to seek additional material, training, and experience, especially in content areas for which the candidate is not adequately prepared. Candidates are encouraged to prepare for CWEA certification exams using as many different study materials as possible plus education events and on-the-job training. Candidates are encouraged to develop their own personal study plan based on individual needs and knowledge. Taking our free self-evaluation can help identify strengths and areas to work on.

Domain 1 – Collection System Operations and Maintenance	
Sub-Domain 1.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 224-229, 263-268, 422-464 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 279-309, 311-321, 412-422
Sub-Domain 1.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 224-280 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 20, 270-274, 414-422
Sub-Domain 1.3	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 303-401

	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 135-241, 249-278
Sub-Domain 1.4	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 224-229 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 425-478
Domain 2 – Collection System Management	
Sub-Domain 2.1	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 454-456
Sub-Domain 2.2	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 250-258, 350-364, 427-428
Sub-Domain 2.3	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 335-345, 351-353, 448
Sub-Domain 2.4	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 365-374, 449
Domain 3 – Safety and Regulations	
Sub-Domain 3.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 88-217 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 381-411
Sub-Domain 3.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 9-16, 88-216 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition. Pages 250-258, 363-365, 381-382, 453-454

Suggested Reference List

- [Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition, Office of Water Programs](#)
- [Operation and Maintenance of Wastewater Collection Systems, Volume 2, 8th Edition, Office of Water Programs](#)
- [State Water Resources Control Board Order WQ 2022-0103-DWQ](#)

Sample Questions

1. Upon finishing a sewer replacement, what should be completed before finalizing the project?
 - a. An inspector report detailing the hours worked and material used
 - b. The final progress billing from the contractors, including verification of time logs
 - c. A complete closed-circuit television (CCTV) of the inside of the pipe showing details of all the construction features
 - d. A soil sample report detailing the ground conditions at every stage of the project
2. You are overseeing an active spill where the sewage running along the street has entered a storm drain. The overflow has stopped. What is the best approach to containment and cleanup?
 - a. Cover the storm drain catch basin inlet to prevent more sewage from entering, plug the storm drain downstream of the spill, clean the storm drain removing all the sewage.
 - b. Allow the remaining sewage on the roadway to enter the storm drain to keep the sewage off the street where it could potentially encounter residents. Clean the storm drain removing all the sewage.
 - c. Using a nearby water hydrant, begin flushing the street into the storm drain. Allow the water to fully dilute the sewage in the storm drain until there is no evidence of sewage debris or smell.
 - d. Cover the storm drain catch basin inlet to prevent more sewage from entering, calculate the amount of sewage that entered the storm drain, and report the amount as lost into a state waterway.
3. Which of the following is the most effective method a manager can use in developing a budget for the next year?
 - a. Layoff employees when revenues are below expectations.
 - b. Involve the community to develop priorities for spending.
 - c. Push repairs out to future years to compensate for increased labor costs.
 - d. Maintain accurate financial records from prior years as a baseline.

4. A subordinate employee is observed slurring their speech and smells strongly of alcohol when performing a task after lunch. What should you do?
 - a. Tell the employee to clock out and go home immediately.
 - b. Notify human resources that you will be taking the employee to the clinic for testing for reasonable suspicion of alcohol use during work.
 - c. Allow the employee to continue the task then see if they have sobered up enough to perform their required duties.
 - d. Watch the employee and document their future behavior to see if there is a continued pattern of behavior.
5. A spill occurred within the service area of a nearby jurisdiction to which an estimated 1,528 gallons of sewage traveled to a dedicated stormwater infiltration basin and 127 gallons traveled to a nearby creek that is a tributary of a recreational lake. Of the options below, which defines the correct spill category and reporting timeline requirements?
 - a. This spill is a Category 1 and an initial draft spill report must be submitted as soon as possible but no later than 7 business days after becoming aware of the spill.
 - b. This spill is a Category 2 and an initial draft spill report must be submitted as soon as possible but no later than 7 business days after becoming aware of the spill.
 - c. This spill is a Category 1 and an initial draft spill report must be submitted as soon as possible but no later than 3 business days after becoming aware of the spill.
 - d. This spill is a Category 2 and an initial draft spill report must be submitted as soon as possible but no later than 3 business days after becoming aware of the spill.
6. Which of the following topics are best suited for a tailgate safety session?
 - a. Confined space rescue, bloodborne pathogens, respiratory protection
 - b. Excavations, hazard communication, first aid refresher
 - c. Safe and economical driving, hand tool safety, personal hygiene
 - d. Firefighting, self-contained breathing apparatus (SCBA) refresher, crane operations

Answer Key

1. C – Domain 1
2. A – Domain 1
3. D – Domain 2
4. B – Domain 2
5. C – Domain 3
6. C – Domain 3

FORMULA SHEET

This formula sheet is available onscreen during the exam.

Conversions	
12 inches = 1 foot 36 inches = 3 feet = 1 yard 5,280 feet = 1 mile 1,440 minutes = 1 day = 24 hours. 144 square inches = 1 square foot 9 square feet = 1 square yard 43,560 square feet = 1 acre 1,728 cubic inches = 1 cubic foot	27 cubic feet = 1 cubic yard 1 cubic foot of water contains 7.48 gallons 1 cubic foot of water weighs 62.4 pounds 1 gallon of water weighs 8.34 pounds 1 million gallons per day (mgd) = 694 gallons per minute (gpm) 1 million gallons per day (mgd) = 1.55 cubic feet per second (cfs) 1 horse power = 0.746 kilowatts (kw) 1 kilowatt = 1,000 watts

Formulas	
Flow	Q = Flow
Q = AV	A = Area
	V = Velocity
Area	L = Length
Rectangle: A = LW	W = Width
	D = Diameter
Circle: A = 0.785D ²	A = Area
Circumference of a circle	C = Circumference
C = 3.14D	D = Diameter
Volume	Vol = Volume
Rectangle Solid: Vol = LWd	d = Depth
	D = Diameter
	W = Width
Cylinder: Vol = 0.785D ² L OR 3.14R ² L	L = Length
Distance	Slope
$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	$\frac{\text{Rise}}{\text{Run}} = \text{Slope}$

*** Assume 100 gallons per capita (person) per day (gpcd) for average daily water flow for all problems**

CREATING A STUDY PLAN

Completing a Gap Analysis

CWEA certification exams are experience based. The Gap Analysis Tool is designed to help candidates identify which grade level is best suited to their current level of experience, and where they may be lacking sufficient experience.

This free self-evaluation is available on the [CWEA website](#) for all vocations.

Candidates are encouraged to develop their own personal study plan based on individual needs, experience and knowledge. Candidates should seek as many different study materials as possible as well as attend educational events and on-the-job training. This is especially important for areas in which the candidate is not adequately prepared.

CWEA's exams do not correspond directly to any specific textbook, educational course, or program. Instead, the exams are based on an analysis of the duties commonly performed in actual practice.

CWEA Local Section Training

It is the goal of CWEA's Technical Certification Program to operate in line with established best practices for certification programs. As such, CWEA is careful to separate its education and training activities from its certification program to ensure that no conflict of interest exists. Any educational materials or trainings that are designed to prepare candidates for an exam are developed and conducted by individuals that do not have access to the exams.

CWEA Local Sections host education and training events throughout the year that focus on the job duties tested by our certifications. These trainings are limited based on demand and volunteer availability.

Local Section trainings can be found on the [CWEA Events Website](#). For questions about a Local Section training, please contact the Local Section directly. Contact information for individual Local Sections can be found in our [Directory](#).

EXAM DAY INFORMATION

Test Site Admission and Exam Information

Applicants are required to show at least one current, valid, government-issued photo identification, such as a state driver's license or ID, or passport. A temporary license is acceptable if there is an expiration date, or if it is accompanied by paperwork explaining an expiration date.

Candidates have three (3) hours to complete the exam.

The formula sheet from this Handbook will be available on the exam screen.

For more information about the number of questions on each exam, see *Exam Scoring* (p. 78).

Calculators Allowed

An onscreen calculator with basic and scientific capability is available on all CWEA exams. Applicants may bring a handheld calculator to a test center as long as it is from the CWEA approved calculator list:

Casio	All FX-115 models (any Casio calculator with FX-115 in its name)
Texas Instruments	All TI-30x and TI-36x models
Sharp	EL models <i>except</i> EL-W516B and EL-W535B

Pearson VUE's Candidate Rules Agreement

Pearson VUE maintains its own rules regarding professional examinations. All applicants are required to sign the [Candidate Rules Agreement](#) at the test center prior to sitting the exam. Applicants are responsible for knowing and complying with these rules. CWEA recommends all applicants familiarize themselves with this agreement prior to testing.

AFTER THE EXAM

Exam Result Notification

Applicants will see their result on the screen immediately after the exam is submitted. An Official Score Report will be printed out and given to the applicant before they leave the test center. Additional copies can be obtained by logging into the [Pearson VUE user account](#). All results are confidential and will only be released to the applicant. No results will be given over the phone, by fax or email.

Exam Appeal Policy

All appeals must be submitted within two weeks of the exam date. Appeals will be reviewed by CWEA staff and/or Subject Matter Experts. Candidates' personal information will remain confidential and will not be accessible to Subject Matter Experts. Candidates will be updated on the status of their appeal within 4-6 weeks, and they will be notified in writing when a decision has been made. Once an appeal has been processed, candidates cannot submit a new appeal for the same exam.

Candidates cannot submit an appeal simply because they did not pass the exam.

Candidates can appeal under the following justifications:

Exam Delivery Appeal

Candidates may appeal testing conditions severe enough to have caused a major disruption of the examination process. CWEA staff will review the appeal and consult our exam administrator, Pearson VUE, to investigate the appeal if necessary. Please note, under Pearson VUE's candidate agreement, candidates must notify the proctor immediately during the exam of any issues to open a claim documenting the incident. If candidates did not notify the proctor during the exam, an appeal may still be submitted but may be dismissed if CWEA cannot verify the validity of the complaint.

Exam Question Appeal

If the candidate wishes to comment on specific exam questions, they may flag the question during the exam using the Flag to Enter a Comment function. Candidates are allowed to add comments about any question as long as there is time remaining. All comments will be

reviewed and considered by the Technical Certification Program as part of the ongoing exam review and development process. Candidates that wish to submit an appeal of their exam results, must complete the form below within two weeks of their exam date. Candidates that wish to have specific comments considered in support of their appeal should indicate so on the appeal form.

Non-substantive appeals or appeals without just cause will be automatically rejected. If candidates are not satisfied with the outcome of their appeal, they may submit a request for review by the Technical Certification Program Executive Committee at tcpcommittee@cwea.org. The committee's decision will be final.

All communication related to certification decisions and appeal results with the Technical Certification Program Executive Committee must be sent in writing to tcpcommittee@cwea.org. We ask that candidates do not contact committee members directly.

The appeal form can be accessed here: [CWEA Exam Appeal Form](#).

Retest Application

If the candidate does not pass the exam the first time, they can submit a retest application along with the appropriate fees. The candidate will be required to skip at least one exam window before they are eligible to retest. If the candidate tested within the first 15 days of a window, they are not required to skip an exam window. Under no circumstances are candidates allowed to sit for the same exam twice in the same window. There are no exceptions to this policy.

To be eligible to use the retest application form, candidates must submit the application within one year of their original exam date. Candidates must meet the minimum qualifications of the exam for which they are applying. CWEA may require candidates to fill out a full application with job history to verify candidates meet the minimum requirements. Use of a retest application does not guarantee approval for any exam.

Receiving the Certificate and Blue Card

Certificates and Blue Cards will be issued to all candidates who pass their exam. The certificate contains the certification number and expiration date. The Blue Card contains the expiration date, contact hour due date and contact hour period. These documents are mailed along with

the Score Report within 4 weeks to the address on file with CWEA. Candidates are responsible for making sure this address is current.

MAINTAINING CERTIFICATION

How to Renew

All certifications must be renewed annually. Certifications expire one year from the last day of the month in which the certification was earned. Renewal notices are mailed to certification holders three months before the expiration date. Certification holders can pay their renewal online by logging into their mycwea.org account or by mailing their renewal notice with a check or credit card information to the CWEA office. Renewal certificates and blue cards will be mailed within 4 weeks to the address on file with CWEA.

Certification holders are required to meet Continuing Education (CE) requirements. This requirement is met by completing 12 contact hours (1.2 CEUs) of vocation-related education or training every two years. For more information about earning contact hours, for details see *Earning Contact Hours* (p. 71).

Not meeting these requirements by the expiration date will cause the certification to expire. Certifications that have been expired for more than three months are subject to a \$35 late fee. If a certification holder does not meet the renewal requirements within two years of their expiration date their certification will permanently expire. To become certified once again, the individual must re-apply for certification and pass the exam. It is the certification holder's responsibility to ensure that his or her certification remains valid. There are no exceptions to these policies.

Renewal Fees

Current fees are listed on the [CWEA website](https://www.cwea.org). Valid CWEA members qualify for a discounted member rate. The non-member rate includes a one-year CWEA membership. If an applicant does not wish to take advantage of the membership, please inform CWEA.

Continuing Education (CE) Requirement

Certification holders are required to meet Continuing Education (CE) requirements. This requirement is met by completing 12 contact hours (1.2 CEUs) of vocation-related education or training every two years. Certification holders may submit up to 50% (6 contact hours) of the required contact hours in safety related training. One contact hour is defined as 50 minutes of participation in an organized continuing education experience under responsible sponsorship, capable direction, and qualified instruction.

Contact hours must be earned within the contact hour period. Hours are earned on the date of completion of the educational or training program. The program may begin before, but must be completed during the contact hour period. If a certification holder will not earn the required hours within their contact hour period, they must notify CWEA before the period ends if they wish to remain certified, for details see *Temporary Deactivation* (p. 73).

Individuals holding more than one CWEA certification can apply the same contact hours to each certification as long as the training is relevant to each vocation. Training is acceptable as long as it is related to the vocations in which certification is held. CWEA may send contact hour certificates to Subject Matter Experts to determine relevancy.

In-house training can be used to meet this requirement as long as standard Safety Tailgate meetings do not exceed 50% (6 contact hours). In-house training includes any training that is conducted by an employer, or a trainer contracted by an employer.

Earning Contact Hours

Contact hours may be earned by any of the following activities:

- Attendance at educational/training programs, including in-house training
- Teaching, instructing or presenting educational/training material (1 hour per 25 min)
- Developing and reviewing CWEA certification exam content as a Subject Matter Expert (1 hour per 25 minutes)
- Authorship of published books or articles (2 hours per book or article)
- Retesting and passing the relevant CWEA certification exam (12 hours)
- Membership in professional membership organizations (.5 hours per year, per membership, with a maximum of 6 hours per contact hour period)

CWEA may require and request additional documentation to assess the authenticity and/or relevance of these activities.

This information is paraphrased for clarity from the 02-03 TCP Re-Certification Policy; a full copy of the policy can be requested by contacting the TCP department.

Contact Hour Documentation

Proof of contact hour completion for an educational/training program must meet these following guidelines:

- The name of the training organization
- The training title
- The name of the attendee who completed the program
- The number of contact hours earned
- The date of completion
- An official signature or stamp from the training organization, instructor's signature is acceptable

For other continuing education activities, CWEA may request additional information. Any documentation that does not meet these guidelines will not be accepted. It is the certification holder's responsibility to retain verification of records documenting earned contact hours and submit proof to CWEA.

Contact Hour Audit

Audits are conducted on a regular basis by CWEA to ensure that certification holders are complying with the continuing education requirement and that the documentation meets the guidelines. Certification holders are randomly selected for an audit of contact hours. The audit reviews the relevancy of the trainings to the vocation, and the dates in which the contact hours were earned to ensure that they fall within the appropriate contact hour period.

Selected participants will be notified via email that they have either successfully passed the audit, or that CWEA requires further information.

Temporary Deactivation

The Temporary Deactivation program is for certification holders that will not meet the continuing education requirement for recertification by their expiration date. Under this program, certification holders can request that CWEA temporarily deactivate their certification for up to two years from their expiration date. This grants the individual extra time to earn the required contact hours. During the time of temporary deactivation, the CWEA certification is invalid and may not be used. Certification holders can apply for reactivation once they fulfill all requirements. Certification must be in good standing to qualify for this program. For more information including current fees, or to request an application for temporary deactivation, contact the CWEA office.

The application must be submitted before the certification expiration date. There is no exception to this policy.

Reinstating Certification

If a certification expires, it is invalid until all recertification requirements are met. There is a three-month grace period before a certification is considered lapsed. Once a certification becomes lapsed, the certification holder will need to pay a \$35 late fee in addition to meeting the renewal requirements. Certification will remain lapsed for up to two years from the expiration date. If a lapsed certification is not renewed within the two-year period, the certification becomes permanently expired.

Expired Certification

Certificates expired for two years, or longer, cannot be reinstated under any circumstances. To become certified once again, the individual must re-apply for certification and pass the exam. It is the certification holder's responsibility to ensure that his or her certification remains valid. There are no exceptions to these policies.

Retiring Certification

Certification holders can request that CWEA retire their certification at the time it expires if they no longer wish to hold it. Once a certification has been retired, the certification will no longer be valid and CWEA will cease all communications regarding the certification. A retired

certification can be reactivated only if the certification holder has met all renewal requirements within the appropriate timeframe and the certification has not permanently expired.

POST-NOMINALS

Use of Certification Post-Nominals

CWEA certification holders are authorized to use post-nominal designations to indicate their certification status. Post-nominals are the letter designations that follow an individual's name and reflect the specific certification and grade level earned through CWEA's certification program. When used appropriately, post-nominals provide a clear and professional method for demonstrating technical competence and commitment to continued professional development in the water quality industry.

Authorized Use

Certified individuals may include their post-nominals in professional settings such as email signatures, business cards, resumes, LinkedIn profiles, and other appropriate communications. The format must include the acronym and the grade level achieved. For example, a Collection System Maintenance Grade 2 certificant may present their name as:

First Name Last Name, CSM2

The following table outlines the approved post-nominals for each vocation and grade:

Vocation	Grade 1	Grade 2	Grade 3	Grade 4
Collection System Maintenance	CSM1	CSM2	CSM3	CSM4
Environmental Compliance Inspector	ECI1	ECI2	ECI3	ECI4
Laboratory Analyst	LAB1	LAB2	LAB3	LAB4
Mechanical Technologist	MT1	MT2	MT3	MT4
Electrical & Instrumentation	EIT1	EIT2	EIT3	EIT4

Limitations on Use

Only individuals who currently hold an active CWEA certification may use the associated post-nominal designation. The use of post-nominals is strictly prohibited by individuals who:

- Are not currently certified by CWEA
- Have allowed their certification to expire
- Have had their certification revoked or suspended

Misuse of post-nominal designations constitutes a violation of CWEA's Code of Ethics and may result in disciplinary action, including revocation of certification. Certification status is subject to verification by CWEA at any time.

It is the responsibility of each certification holder to ensure their use of post-nominals accurately reflects their current certification status. Certification holders are encouraged to update their professional profiles and communications to include the appropriate post-nominals only while the certification remains active and in good standing.

Questions regarding the use of post-nominals may be directed to CWEA Certification staff at tcp@cwea.org.

EXAM DESIGN AND FORMAT

Exam Design

All certification exams are designed to test knowledge required to perform the essential duties of a job at a given grade level with minimum acceptable competence. Exams are created by Subject Matter Experts under the guidance of exam development professionals.

Exam content is developed from a job task analysis that includes research of the essential duties at a representative cross-section of systems and facilities throughout California. All exam items are written by subject matter experts based on the content outline established by the job task analysis. These items are used to create the exam forms. The pass point for each

exam is based on difficulty, using the Modified Angoff Method, for details see *Pass Point* and *How Pass Points are Set* (p. 77).

Exam Delivery Mechanism

All exams are computer-based format and are available in the English language only. Exams are delivered at Pearson VUE testing centers or via Pearson VUE's online testing platform On Vue.

Exam Format

All certification exams are in multiple-choice format. Multiple-choice is considered the most effective format for use in standardized tests as it allows for greater content coverage for a given amount of testing time and improves competency measurement reliability. Multiple choice questions range in complexity from simple recall of knowledge to the synthesis and evaluation of the subject matter.

Number of Exam Questions

The number of questions varies by exam grade level. Each exam is designed to evaluate a range of competencies, with the following total number of questions:

- Grade 1 – 100 questions
- Grade 2 – 100 questions
- Grade 3 – 100 questions
- Grade 4 – 85 questions

Weighting

The percentage of the exam that covers a particular content area is referred to as its weighting. Weightings are established through a Job Task Analysis and are based on the frequency and criticality of the task. A weighting is approximate and shows the relative importance of a particular area compared to the other portions of the exam. Weightings are indicated on the content outline for each exam and can be found in the preparation materials. Each weighting on the actual certification exam may vary slightly.

Pass Points

An exam pass point is the minimum score required to pass a certification exam. The pass point is also known as a cut score or passing score. Candidates should try to score as high as possible on their exam. Pass points for CWEA certification exam vary with each exam form. The pass point for each vocation, grade level and exam form is set independently.

How Pass Points are Set

A modified Angoff Method is used to determine the pass point for each version of each exam. The modified Angoff Method uses expert judgments to determine the difficulty level of the exam. The easier the exam, the higher the pass point. Likewise, the more difficult the exam, the lower the pass point.

The following is a basic outline of the modified Angoff Method (some details have been omitted):

1. A group of Subject Matter Experts (SMEs) independently rate each exam question within a given exam. The ratings are defined as the probability, or likelihood, that a minimally competent person with the requisite education and experience will answer the question correctly. A minimally competent person is defined as someone who adequately performs all job functions safely and requires no further training to do so.
2. The SMEs review each exam question as group. A consensus is reached for the rating of each exam question. During this time the SMEs review comments submitted in writing by exam-takers. Any exam question that is judged to be ambiguous, has more than one correct answer, or has no correct answers is eliminated from the scoring process for that exam. These exam questions are then revised for future use, re-classified, or deleted from the exam item bank.
3. After the data are refined, the final step is to calculate the mean, or average, of all the exam question ratings. This becomes the overall pass point estimation.

Why Use Modified Angoff?

Each version of a given certification exam pulls questions from an exam item bank. Each of these questions varies in difficulty. Because a different mix of questions is used in each exam form, the overall difficulty level is not fixed. Thus, it is important to make sure that the varying difficulty level is reflected in the pass point of each exam to ensure that results are reliable. Exam reliability is concerned with the reproducibility of results for each version of a given

exam. In other words, for an exam to be reliable it must yield the same result (pass or fail) for the same individual under very similar circumstances. For example, imagine a candidate takes an exam at a certain grade level and passes it. Immediately after completing the exam, the candidate takes the same grade level exam, but a different version. If the exam is reliable they will achieve the same result: pass. If they do not, it is likely that the exam is not a reliable measure of minimal competency.

By taking into consideration the difficulty level of an exam, the modified Angoff Method significantly increases the reliability of the exams. Also, since each exam is adjusted for difficulty level, each exam version has the same standard for passing. Thus, exam-takers are treated equitably and fairly, even if they take different versions of the exam.

There are other methods for setting pass points. However, for the type of exams administered by CWEA, the modified Angoff Method is the best.

Exam Scoring

All exams are electronically scored by Pearson VUE. Each question is worth one point unless otherwise stated on the exam. After exams are scored, total points are compiled, and an overall score is calculated as the sum of all points earned on the exam. If the overall score is equal to, or greater than the established pass point, the candidate has passed the exam. Each question is worth 1 point. Total points possible for each exam are as follows:

- Grade 1 – 100 points
- Grade 2 – 100 points
- Grade 3 – 100 points
- Grade 4 – 85 points

Summary of Certification Activities

A summary of certification activities for each vocation is available upon request. The summary includes pass/fail statistics, and the number of individuals currently certified. To request this information, please visit the [CWEA website](https://www.cwea.org).