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CWEA TECHNICAL CERTIFICATION PROGRAM

Collection System Maintenance **Candidate Handbook**

CSM CERTIFICATION

v07.15.20

Collection System Maintenance **Candidate Handbook**

Version 07.15.2020

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 and at the bottom of each page.

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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 Systems 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 1st – December 31st	August 31st
WINTER	January 1st – March 31st	November 30th
SPRING	April 1st – June 30th	February 28th
SUMMER	July 1st – September 30th	May 31st

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.

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	▪ No experience required ▪ (1 year of experience in the vocation is recommended)
GRADE 2	▪ 2 years of experience in the vocation
GRADE 3	▪ 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 associates degree
GRADE 4	▪ 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 associates 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 $40 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.

The full process can be viewed here: CWEA Ethics Policy.

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

888-749-3381. Test centers are conveniently located throughout the U.S. Locations can be found on Pearson VUE's Test Center Search.

Online Proctored Exams

Online proctoring is available for some 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 is provided, no physical calculators or scratch paper are allowed.**

For more information about the online proctored experience, please see: https://home.pearsonvue.com/cwea/onvue. 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.

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 $80 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 $80 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 $40.

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 2020.

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 – Systems Operations, Inspections, and Maintenance	36%
Domain 2 – Records, Documentation, and Mapping	17%
Domain 3 – Safety and Customer Service	23%
Domain 4 – Vehicles, Equipment, and Grounds	16%
Domain 5 – Math for Collection Systems	8%
Total	100%

Domain 1: Systems Operations, Inspections, and Maintenance

Sub-Domain 1.1:

Inspection, cleaning and maintenance of wastewater collection systems utilizing equipment

1. Choose the most effective way to remove root systems, sand, and grit from sewer systems
2. Identify parts of a standard sewer and their functions
3. Understand methods and procedures of preventative maintenance
4. Understand mechanical cleaning systems
5. Understand the use of high-velocity sewer cleaners, mechanical rodding machines, hydraulic winches
6. Understand CCTV inspection equipment
7. Understand necessity of sewer cleaning
8. Analyze situations and choose the most effective cleaning method
9. Understand how to make observations and problem solve during manhole cover inspections
10. Understand self-cleaning sewers and the appropriate wastewater velocity
11. Understand the concepts of preventive, predictive, and reactive maintenance
12. Understand the type of sewer cleaning that calls for a trap

13. Understand the basic use of sewer chemicals for controlling grease, odor, roots, etc.

Sub-Domain 1.2:

Performing and giving assistance with pump station inspections, maintenance, and repair and recording instrument readings

1. Understand Lockout/Tagout procedures
2. Define important terms needed to properly execute an inspection
3. Read and analyze gauges, meters, and pumps
4. Understand warning tag labels
5. Recognize the basic components of a pump
6. Understand the basic functions of pump controls

Sub-Domain 1.3:

Inspection and maintenance of easements, some of which may be remote or difficult to access

1. Describe what easement road maintenance includes
2. Describe how to exercise caution to prevent injuries, damage to private property or environmentally sensitive areas
3. Understand the need for easement maintenance

Sub-Domain 1.4:

Participation in the construction and repair of the wastewater collection system

1. Understand how to mark sewer pipe locations in accordance with Underground Service Alert guidelines
2. Identify hazardous gases
3. Understand construction practices and principles including excavation and shoring
4. Demonstrate how to calculate the volume of a sewer trench
5. Describe how to employ safe strategies when excavating trenches
6. Identify the correct tools to use for installation and repairs
7. Describe how to replace and repair damaged pipes or maintenance structures
8. Understand the purpose of raising maintenance structures to grade after paving activities
9. Understand sewer flow in an excavation
10. Recognize good safety practices when working in a manhole
11. Identify preparation steps to take before driving to a repair job and solving issues that may arise
12. Describe how to protect oneself and other employees during trench excavations

13. Identify a manhole cover and valve parts and functions
14. Identify information that is needed before one can execute a proper sewer repair
15. Understand the role of the Competent Person on the job
16. Identify the correct reasons for utilizing various repair methods such as excavation repair and trenchless repair
17. Understand the appropriate PPE (Personal Protective Equipment) related to construction and repair

Sub-Domain 1.5:

Participation in the containment and cleanup of Sanitary Sewer Overflows (SSOs)

1. Calculate spill volume of a SSO
2. Understand the State of California Waste Discharge Requirements
3. Identify spills and overflow and containment/cleanup procedures

Sub-Domain 1.6:

Participation in the safe removal and restoration of concrete and paved surfaces using a wide variety of construction equipment, hand and power tools

1. Solve problems that arise with asphalt and concrete removal
2. Understand the use of jack hammers and surface cutting tools
3. Identify the correct tools used to complete a job
4. Identify when to use different backfill materials
5. Understand the importance of proper compaction

Domain 2: Records, Documentation, and Mapping

Sub-Domain 2.1:

Completion and maintenance of accurate, legible, and timely records of work performed

1. Recognize work-related terms and acronyms and their meanings
2. Understand how to document activities and complete forms
3. Understand the need for accuracy and the consequence for inaccurate or incomplete (or non-existent) documentation

Sub-Domain 2.2:

Reading and interpreting collection system maps for operations and maintenance

1. Comprehend improvement plans to system maps.
2. Read and interpret system maps to report to field locations

3. Identify basic structures (manholes, mains, laterals, siphons, etc.) and flow direction on a map

Domain 3: Safety and Customer Service

Sub-Domain 3.1:

Participation in establishing proper traffic control measures at work sites to protect workers and the public

1. Define a clear workspace to inform both workers and the public
2. Understand personal safety and health during traffic control
3. Implement proper traffic control measures
4. Identify traffic control measures that need to be taken at night
5. Identify various traffic control devices (advance warning signs, stop/slow paddles, flags, barricades, delineators, cones, drums, etc.) and when to use them
6. Identify the different types of temporary traffic control zones and how to correctly set up a temporary traffic zone with regard for public safety
7. Identify the correct safety equipment for self and others
8. Understand the appropriate PPE related to traffic control

Sub-Domain 3.2:

Knowledge of all applicable regulations, policies, and procedures

1. Understand the protocol for reporting overflows and spills
2. Understand when high-visibility clothing or devices are required
3. Recognize safety and indicator markings related to sanitary sewers
4. Understand the Injury and Illness Prevention Program (IIPP) required by Cal OSHA and how it protects workers
5. Understand the purpose of the agency safety policy statement
6. Knowledge of the components of a Safety Data Sheet (SDS)
7. Knowledge of First Aid and CPR
8. Understand basic elements of “Worker Right-To-Know” laws

Sub-Domain 3.3:

Application of safety-related tasks related to excavation and trenching

1. Recognize the color codes used for marking underground utilities
2. Identify the conditions when shoring is required
3. Understand how soil conditions affect trench stability
4. Know the minimum distance that the soil must be kept from the edge of an excavation

5. Understand when, where, and how ladder(s) should be placed in a trench
6. Identify the different types of shoring equipment – e.g., hydraulic shores, screw jacks, pneumatic shores, solid sheeting, etc.

Sub-Domain 3.4:

Participation in confined space entries

1. Remove access covers safely
2. Identify confined space roles (entrant, attendant, supervisor, rescue) and associated responsibilities
3. Identify gas types to be monitored when entering a confined space
4. Define a Permit Required Confined Space and understand how to complete a confined space permit
5. Identify how to assess and safely handle atmospheric hazards while inspecting confined spaces
6. Understand how to secure safe working spaces and conditions in confined spaces
7. Understand how to use a self-contained breathing apparatus
8. Understand the operation of retrieval device for rescue purposes
9. Understand the appropriate PPE (Personal Protective Equipment) related to confined space
10. Understand the procedures for proper inspection of confined space equipment

Sub-Domain 3.5:

Adhering to safe work practices to mitigate risk related to jobsite hazards

1. Understand how to read monitoring equipment accurately and respond to unsafe conditions
2. Recognize personal safety and health measures
3. Identify unsafe equipment
4. Understand how to employ safe practices in a wet well
5. Understand how to operate a high velocity cleaning machine safely
6. Identify the correct PPE that is needed to reduce safety risks
7. Identify potential problems and hazards that arise from poor design velocity
8. Identify proper lifting techniques
9. Identify the proper sequence for Lockout/Tagout procedures
10. Recognize what type of fire each fire extinguisher should be used for – i.e., Class A, Class B, Class C, Class D

Sub-Domain 3.6:

Responding to public inquiries and service requests in a courteous manner and providing information appropriate to the area of assignment

1. Understand how to communicate effectively with members of the public

2. Understand how to respond to service calls and questions professionally
3. Demonstrate public professionalism and courtesy
4. Understand collection system operation and maintenance issues that may arise
5. Understand how to respond to requests according to professional work standards

Domain 4: Vehicles, Equipment, and Grounds

Sub-Domain 4.1:

Conducting pre/post trip inspections of vehicles and equipment (including ensuring that hand and power tools are in proper operating condition), and arranging for maintenance when required

1. Describe what constitutes a pre- and post- trip inspection on commercial vehicles
2. Recognize who is responsible for different safety checks
3. Describe operator-related maintenance
4. Understand how to effectively avoid vehicle accidents
5. Identify vehicle types and when they are used
6. Identify and solve problems that may arise during a trip inspection
7. Understand how to inspect tires in an efficient and safe manner
8. Recognize when equipment poses a safety hazard
9. Identify and solve problems that arise with faulty equipment

Sub-Domain 4.2:

Performing basic building and grounds maintenance at collection system facilities

1. Understand the scope of Building and Grounds Maintenance
2. Inspection and operation of equipment found at collection system facilities
3. Understand how the facility supports the maintenance of the collection system

Domain 5: Math for Collection Systems

Sub-Domain 5.1:

Selecting the appropriate formula and completing basic calculations needed for collection systems maintenance

1. Use formula to calculate distance
2. Use formula to calculate velocity and flow rate

3. Use formula to calculate volume of basic shapes such as cylinder, rectangle, and square
4. Use formula to calculate surface area of a basic shapes such as square, circle, and rectangle
5. Use formula to calculate slope
6. Understand how to execute basic unit conversions in calculations
7. Understand how to calculate trench depth and width, benching, flow rates, and pipe slope

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.

Domain 1 – Systems Operations, Inspections, and Maintenance	
Sub-Domain 1.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 2, 9-10, 33, 49-55, 278-305, 315-319, 323-402, 452-468
Sub-Domain 1.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 142-165, 190-204, 370-382, 468-491 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 14-27, 32-80, 83-93
Sub-Domain 1.3	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 419-472, Glossary Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 520-522
Sub-Domain 1.4	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 89-189, 162-165, 177-181, 412-491, 518-521 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 14-27, 261-330, 357-376, 617 Title 29 CFR 1926.21 Title 29 CFR 1926.650 Title 29 CFR 1926 Subpart P App A California Code of Regulations, Title 8, Section 1541 California Code of Regulations, Title 8, Section 1541.1 California Government Code 4216 California Government Code 4216.2
Sub-Domain 1.5	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 9-16, 226, 518-521 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 624-628 State Water Resources Control Board Order No. 2006-0003-DWQ State Water Resources Control Board Order No. WQ 2013-0058-EXEC
Sub-Domain 1.6	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 119-134, 177-189, 430-437 Title 29 CFR 1926.1204

Domain 2 – Records, Documentation, and Mapping	
Sub-Domain 2.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 23-33, 263-268, 308, 371-376, 488-491 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 94-101, 483-484, 624-628 California Code of Regulations, Title 8, Section 5157
Sub-Domain 2.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 22-77, 412-462 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 11-79, 461-469, 617-618
Domain 3 – Safety and Customer Service	
Sub-Domain 3.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 94-134, 177-189 Watchbook: Work Area Traffic Control Handbook, 2019, 14th Edition
Sub-Domain 3.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 9-16, 94-204, 303-491 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 342-349, 623-631 State Water Resources Control Board Order No. 2006-0003-DWQ State Water Resources Control Board Order No. WQ 2013-0058-EXEC Safety, Health, and Security in Wastewater Systems, 6th Edition The Worker Occupational Safety and Health Training and Education Program – IIPP information page
Sub-Domain 3.3	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 177-191 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 342-347 Title 29 CFR 1910.146
Sub-Domain 3.4	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 134-146 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 358-361

Sub-Domain 3.5	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 146-165, 203-204 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 347 Safety, Health, and Security in Wastewater Systems, 6th Edition
Sub-Domain 3.6	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 72-75 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 519-522, 632-637
Domain 4 – Vehicles, Equipment, and Grounds	
Sub-Domain 4.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 89-102, 224-233 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 148-247 California Commercial Driver Handbook, State of California, Department of Motor Vehicles
Sub-Domain 4.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 224-233, 303-309, 332-347, 422-426, 439-441 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 445-460
Domain 5 – Math for Collection Systems	
Sub-Domain 5.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 27, 56, 426, 501-557

Publications in the Suggested Reference List

- California Code of Regulations Title 8
  - Section 1541
  - Section 1541.1
  - Section 5157
- California Commercial Driver Handbook, State of California, Department of Motor Vehicles
- California Government Code
  - 4216
  - 4216.2
- Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition, Office of Water Programs
- Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition, Office of Water Programs
- Safety, Health, and Security in Wastewater Systems, 6th Edition, Water Environment Federation
- State Water Resources Control Board Order No. 2006-0003-DWQ
- State Water Resources Control Board Order No. WQ 2013-0058-EXEC
- The Worker Occupational Safety and Health Training and Education Program – IIPP information page
- Title 29 CFR
  - 1910.146
  - 1926.21
  - 1926.1204
  - 1926.650
  - Subpart P App A
- Watchbook: Work Area Traffic Control Handbook, 2019, 14th Edition, Bni Building News

Sample Questions

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

1. What type of equipment should be used to excavate a broken sewer pipe?
    a. Front end loader
    b. Bulldozer
    c. Backhoe
    d. Grader
2. What is a mechanical means to dislodge material from a sewer?
    a. High water pressure
    b. Pumping
    c. Scraping
    d. Vacuuming
4. What is the purpose of the OSHA Hazard Communication Standard?
    a. To make all employees aware of the need to prevent hazardous substances from entering sewers
    b. To make each employee a chemical safety expert
    c. To make employees effective communicators with the public
    d. To make sure employees know about any hazardous chemical that they may contact
5. What types of information is important for field crews to record?
    a. Material used on the job
    b. Safety training history
    c. Equipment cost
    d. All of the above
6. What must be checked first before entering a manhole?
    a. Atmosphere in manhole
    b. Gas monitoring equipment
    c. Proper barricades or warning devices around manhole
    d. Harnesses and tripod
7. How can traffic be warned of your presence in the street?
    a. Signs, cones, chairs
    b. Billboards, cones, flagmen
    c. Signs, cones, flagmen
    d. Banners, signs, cones

8. What check should be performed before driving a vehicle?
    a. Mechanical/color
    b. Mechanical/safety
    c. Mechanical/air
    d. Mechanical/chemical
9. How many cubic yards of backfill will be needed to fill a 200 cubic foot trench (Do not allow for compaction)?
    a. 6.9 cubic yards
    b. 7.1 cubic yards
    c. 7.4 cubic yards
    d. 7.8 cubic yards
10. One cubic foot per second flow rate is equal to how many gallons per hour?
    a. 2,794 gallons per hour
    b. 3,600 gallons per hour
    c. 6,000 gallons per hour
    d. 26,928 gallons per hour

Answer Key and Solutions

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

   Solution:

$$V\left[yd^3\right] = V\left[ft^3\right] \times \frac{yd^3}{27\ ft^3} = 200\left[ft^3\right] \times \frac{yd^3}{27\ ft^3} = 7.4\ yd^3$$

9. D – Domain 5

   Solution:

$$Q\left[\frac{gal}{h}\right] = Q\left[\frac{gal}{s}\right] \times \frac{60\,s}{\min} \times \frac{60\,\min}{h} = 1\left[\frac{gal}{s}\right] \times \frac{60\,s}{\min} \times \frac{60\,\min}{h} \times \frac{7.48\,gal}{ft^3} = 26{,}928\,\frac{gal}{h}$$

CSM GRADE 2 EXAM CONTENT OUTLINE

Content Domain	Weighting
Domain 1 – Systems Operations, Inspections, and Maintenance	31%
Domain 2 – Collection Systems Tools and Equipment	10%
Domain 3 – Plans, Maps, As-Builts, and Meters	11%
Domain 4 – Safety and Regulations	26%
Domain 5 – Administration of Collection Systems	17%
Domain 6 – Math for Collection Systems	5%
Total	100%

Domain 1: Systems Operations, Inspections, and Maintenance

Sub-Domain 1.1:

Routine maintenance / cleaning of gravity systems

1. Knowledge of methods of high-velocity cleaning used for gravity systems maintenance
2. Knowledge of methods of mechanical cleaning used for gravity systems maintenance
3. Knowledge of methods of hydraulic cleaning used for gravity systems maintenance
4. Knowledge of root foaming activities
5. Clean manholes, catch basins, and gravity sewers

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. Basic knowledge of trenching and shoring techniques
5. Perform concrete work and cement repair
6. Basic knowledge of pipe materials, fittings, and pipefitting tools and methods
    a. Understand pipe bursting
    b. Understand pipe patching / Cure In-Place Piping (CIPP)

Sub-Domain 1.3:

Operation, maintenance, and repair of pumps and force mains

1. Basic knowledge of SCADA system
2. Knowledge of methods used to repair pumps
3. Operate pumps to remove sewage from damaged or clogged lines, in response to sewer overflows, or when by-pass pumping is required
4. Knowledge of methods used to clean pumps, lift/pump stations, and wet wells
5. Knowledge of pump components

Sub-Domain 1.4:

Sanitary Sewer Overflows (SSOs) and emergency response

1. Knowledge of containment methods
2. Knowledge of clean-up methods and procedures
3. Follow appropriate procedures as the first responder to the SSO
4. Identify categories of SSOs
5. Identify water board notification levels and timeframes
6. Create documentation for reporting of SSOs

Domain 2: Collection Systems 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. Repair CCTV equipment
4. Use SONDE and other locating equipment
5. Record data based on CCTV results
6. Knowledge of equipment used for physical testing methods
    a. Smoke testing
    b. Dye testing

Sub-Domain 2.2:

Tools and equipment for maintenance and repair

1. Operate and maintain vehicles
2. Operate and maintain shoring equipment
3. Operate and maintain hand tools
4. Operate and maintain power tools
5. Operate equipment used for air and water testing of sewer lines
6. Report the need for vehicle and equipment repairs
7. Operate tools that are utilized for clearing vegetation

Domain 3: Plans, Maps, As-Builts, and Meters

Sub-Domain 3.1:

Sewer system / collection system maps

1. Read and interpret system maps (collection and drainage)
2. Make corrections to system / collection maps as needed

Sub-Domain 3.2:

Construction plans, drawings, and specifications

1. Read and interpret construction plans, drawings, and specifications related to collection system projects including underground infrastructure, and related equipment
2. Read and interpret piping sketches and facility record drawings

Domain 4: Safety and Regulations

Sub-Domain 4.1:

Safety policies and procedures / Cal-OSHA

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. Knowledge of Cal-OSHA safety rules and procedures
5. Knowledge of hazards associated with easement maintenance
6. Knowledge of lockout / tagout procedures

Sub-Domain 4.2:

Confined space entry

1. Identify the characteristics of a confined space
2. Perform all work in accordance with Cal-OSHA regulations relating to confined space entry
3. Recognize correct procedure to safely enter and perform required duties in confined spaces
4. Perform confined space entries as an entrant, attendant, and supervisor
5. Use equipment to determine concentration of hazardous gases and oxygen deficiencies in confined spaces
6. Use self-contained breathing apparatus (SCBA) for confined space entry
7. Complete confined space entry permit

Sub-Domain 4.3:

Underground Service Alert

1. Mark and notify Underground Service Alert for location of all utilities within work area
2. Determine if site is ready for work, based on required permits and safe-dig procedures
3. Ensure an underground service alert has been processed if required
4. Locate underground utilities by use of blueprints and electronic locating equipment in accordance with regulations

Sub-Domain 4.4:

Traffic control practices and requirements

1. Knowledge of applicable laws and regulations regarding traffic control
2. Use proper traffic control techniques when working in traffic areas
3. Set up traffic control and barricade equipment

Sub-Domain 4.5:

Trenching and shoring

1. Assess and implement trenching controls based on worksite conditions
2. Knowledge of regulations related to trenching and shoring

Sub-Domain 4.6:

Hazardous materials

1. Knowledge of safety equipment and practices related to the handling of hazardous chemicals
2. Identify hazardous materials and proper disposal methods using Safety Data Sheet (SDS)
3. Knowledge of bloodborne pathogens

Sub-Domain 4.7:

Environmental protection regulations

1. Basic knowledge of Statewide General Waste Discharge Requirements (WDR) for sanitary sewer systems
2. General knowledge of Sewer System Management Plan (SSMP) requirements per the WDR
3. General knowledge of 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. Note and report on condition of infrastructure (sewer mains, laterals, and manholes)
3. Maintain permit, easement, as-built, and blueprint records accurately

Sub-Domain 5.2:

Customer service and communication

1. Interact with the public to answer questions, identify applicable laws, rules, and regulations
2. Receive, record, and respond to customer inquiries and complaints regarding sewer overflows and stoppages, sewer odors, and repair work
3. Provide the general public with sewer line location, information, and notification of easement maintenance
4. Work courteously and effectively with the public and with coworkers
5. Understand and carry out oral and written instructions
6. Communicate effectively, both orally and in writing

Sub-Domain 5.3:

Training

1. Assist in orienting or training new personnel
2. Provide training to new and current workers on the proper and safe operation and use of all collection system machinery and equipment
3. Train and evaluate job performance of subordinates

Sub-Domain 5.4:

Planning and supervision

1. Participate in the short and long range planning and scheduling of specific activities to be accomplished by crews under his / her supervision
2. Verify that all information on work orders and blueprints correspond
3. Determine the type of materials, supplies, machinery, or tools to be used for each project, and prepare materials for use
4. Schedule work assignments

Domain 6: Math for Collection Systems

Sub-Domain 6.1:

Basic math used in collection systems maintenance

1. Calculate volume
2. Calculate area
3. Calculate gross vehicle weight rating (GVWR)
4. Calculate flow rate
5. Calculate velocity
6. Calculate elevation
7. Complete SSO-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; the link to that self-evaluation tool follows at the end of this document.

Domain 1 – Systems Operations, Inspections, and Maintenance	
Sub-Domain 1.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 224-296, 302-404 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 573-585
Sub-Domain 1.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 412-492 Enrollee's Guide to the SSO Database: Sanitary Sewer Overflow Reduction Program, August 2013, State Water Resources Control Board
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, 7th Edition. Pages 192-253, 263-328, 620-627
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, 7th Edition. Pages 11-114, 563-566, 629-631
Domain 2 – Collection Systems Tools and Equipment	
Sub-Domain 2.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 303-369
Sub-Domain 2.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 412-421, 439-445, 457-465 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 267-319, 563-566 California Code of Regulations, Title 8, Section 1689
Domain 3 – Plans, Maps, As-Builts, and Meters	

Sub-Domain 3.1	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, 7th Edition. Pages 461-470, 502-507, 616-619 The Worker Occupational Safety and Health Training and Education Program – IIPP information page
Sub-Domain 3.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 422-437 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 463-470, 502-507
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, 7th Edition. Pages 341-376, 443-444 Utility Management, A Field Study Training Program, 2nd Edition. Pages 39-47 Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 357-385 Guide to Developing Your Workplace Injury and Illness Prevention Program Lockout/Tagout Procedures Sample
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, 7th Edition. Pages 358-366 California Code of Regulations, Title 8, Section 5157 OSHA Publication 3138-01R, Permit-Required Confined Spaces
Sub-Domain 4.3	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 178-181, 416-469 DigAlert Website
Sub-Domain 4.4	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 94-134 Watchbook: Work Area Traffic Control Handbook, 2019, 14th Edition

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, 7th Edition. Pages 347 California Code of Regulations, Title 8, Section 5141.1 Title 29 CFR 1926.651 Title 29 CFR 1926.652 Title 29 CFR 1926 Subpart P App A
Sub-Domain 4.6	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 190-216 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 342-354, 345-347 Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 357-385
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, 7th Edition. Pages 627-632 Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 253-279 State Water Resources Control Board Order No. WQ 2013-0058-EXEC
Domain 5 – Administration of Collection Systems	
Sub-Domain 5.1	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 508-516, 620-627 Utility Management, A Field Study Training Program, 2nd Edition. Pages 47-49
Sub-Domain 5.2	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 519-522 Utility Management, A Field Study Training Program, 2nd Edition. Pages 26-28 Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 387-400 DigAlert Website

Sub-Domain 5.3	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 440-441, 614 Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 172-196
Sub-Domain 5.4	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 427-460, 537-550, 568-572, 608-619 Utility Management, A Field Study Training Program, 2nd Edition. Pages 1-3, 6-21, 31-33 Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 10-55, 337-357
Domain 6 – Math for Collection Systems	
Sub-Domain 6.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 449-556

Publications in the Suggested Reference List

- California Code of Regulations Title 8
  - Section 1689
  - Section 5157
  - Section 1541.1
- DigAlert Website
- Enrollee's Guide to the SSO Database: Sanitary Sewer Overflow Reduction Program, August 2013, State Water Resources Control Board
- Guide to Developing Your Workplace Injury and Illness Prevention Program
- Lockout/Tagout Procedures Sample
- Manage for Success, Effective Utility Leadership Practices, 1st Edition. Office of Water Programs
- Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition, Office of Water Programs
- Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition, Office of Water Programs
- OSHA Publication 3138-01R, Permit-Required Confined Spaces
- State Water Resources Control Board Order No. WQ 2013-0058-EXEC
- The Worker Occupational Safety and Health Training and Education Program – IIPP information page
- Title 29 CFR
  - 1926.651
  - 1926.652
  - 1926 Subpart P App A
- Utility Management, A Field Study Training Program, 2nd Edition. Office of Water Programs
- Watchbook: Work Area Traffic Control Handbook, 2019, 14th Edition, Bni Building News

Sample Questions

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

1. What tool would you use to cut VCP pipe?
    a. Hammer
    b. Grinder
    c. Chain pipe cutter
    d. Chisel
2. Proper operation and maintenance of wastewater collection is
    a. allowing stoppages to occur.
    b. allowing SSO to occur.
    c. keeping wastewater flowing through pipes.
    d. collecting fees from the public.
3. One of the advantages of using CCTV is
    a. the ability to see what is happening when camera is underwater.
    b. to record television shows.
    c. that the length and severity of defective pipe areas can be recorded.
    d. visitors are impressed.
4. Protective shoring system option include all but
    a. proper stopping or benching of the sides of the excavation.
    b. working in an un-sloped trench with no shoring.
    c. supporting the sides of a trench with shoring.
    d. using a shield in the excavation area.
5. Based on new Best Practices of the Common Ground alliance for marking underground Utilities, the Inquiry Identification Number for an Underground service Alert (USA) is viable for
    a. 21 days.
    b. 28 days.
    c. 14 days.
    d. 30 days.
6. For a nighttime Short Term Stationary Temporary Traffic Control Zone setup on low speed/low volume street, the minimum height of the traffic cones used shall be
    a. 28" H.
    b. 24" H.
    c. 18" H.

d. 32" H.

7. When a citizen wants information regarding a maintenance operation you should?
    a. Always refer them to a supervisor
    b. Ignore them
    c. Tell them you are not authorized to give out information
    d. Give them as much factual information as you can, and offer to help them further
8. Category 1 SSO's that discharge to a drainage channel and/or surface water must be reported within
    a. 24 hours.
    b. 2 hours.
    c. 2 days.
    d. 2 weeks.
9. An upright circular cylinder tank (flat bottom) has a diameter of 12 feet. When filled to a depth of 8 feet, the volume is?
    a. 226.2 cubic feet
    b. 904.3 cubic feet
    c. 3619 cubic feet
    d. 5000 cubic feet
10. Calculate a flow rate of 650 gallons per minute in million gallons per day.
    a. 0.472 mgd
    b. 0.936 mgd
    c. 1.714 mgd
    d. 1.923 mgd

Answer Key and Solutions

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

   Solution:

$$V\left[ft^3\right]=\frac{\pi}{4}\times D^2\left[ft^2\right]\times H\left[ft\right]=0.785\times 12^2\left[ft^2\right]\times 8\left[ft\right]=904.3\,ft^3$$

10. B – Domain 6

    Solution:

$$Q\left[\frac{Mgal}{d}\right]=Q\left[\frac{gal}{\min}\right]\times\frac{60\min}{h}\times\frac{24\,h}{d}\times\frac{M}{10^6}=650\left[\frac{gal}{s}\right]\times\frac{60\min}{h}\times\frac{24\,h}{d}\times\frac{M}{10^6}=0.936\frac{Mgal}{d}$$

CSM GRADE 3 EXAM CONTENT OUTLINE

Content Domain	Weighting
Domain 1 – Systems Operations, Inspections, and Maintenance	29%
Domain 2 – Collection Systems Tools and Equipment	10%
Domain 3 – Plans, Maps, and As-Builts	16%
Domain 4 – Safety and Regulations	19%
Domain 5 – Administration of Collection Systems	22%
Domain 6 – Math for Collection Systems	4%
Total	100%

Domain 1: Systems Operations, Inspections, and Maintenance

Sub-Domain 1.1:

Preventive / routine maintenance, cleaning, and repair of sewer systems

1. Perform lead duties and supervise in the inspection and maintenance of sewer lines, storm drain system, lift/pump stations, and manholes
2. Evaluate, coordinate, and monitor preventive maintenance and root control programs, and make adjustments as necessary
3. 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, historical documents)
5. Make assessments related to and supervise the repair or replacement of mains, manholes, and other collection system infrastructure

Sub-Domain 1.2:

Sanitary Sewer Overflows (SSOs) and emergency response

1. Submit SSO reports on the California Integrated Water Quality System (CIWQS)

2. Report and assist with reporting SSOs in a timely manner as prescribed by applicable regulations to the proper regulating agency
3. Oversee containment and clean-up of SSOs
4. Respond to emergency sewer calls
5. Direct emergency response activities including repairs, SSO response, storm response, incident command and/or coordination, and EOC support
6. Validate data associated with direct spill response activities

Domain 2: Collection Systems Tools and Equipment

Sub-Domain 2.1:

Equipment for inspection

1. Utilize CCTV for inspection and assess condition of collection system projects and/or sewer inspection permits
2. Oversee CCTV program for collection systems
3. Understand and apply condition assessment standards
4. Evaluate the maintenance needs of CCTV equipment

Sub-Domain 2.2:

Tools and equipment for maintenance and repair

1. Advise utilities staff, design consultants, engineers, and contractors in acquisition and installation of new equipment
2. Supervise safe operation and maintenance of vehicles
3. Supervise safe operation and maintenance of shoring equipment
4. Supervise safe operation and maintenance of hand tools
5. Supervise safe operation and maintenance of power tools
6. Supervise safe operation and maintenance of equipment used for air and water testing of sewer lines
7. Oversee the need for vehicle and equipment repairs

Domain 3: Plans, Maps, and As-Builts

Sub-Domain 3.1:

Sewer system / collection system maps

1. Oversee the operation and use of GIS systems
2. Evaluate spatial collection system data to plan and route work

Sub-Domain 3.2:

Construction plans, drawings, and specifications

1. Understand, evaluate, and prepare comments on construction plans, drawings, and specifications related to collection system projects, including underground infrastructure and related equipment
2. Recommend modifications to plans, maps, layouts, piping sketches, and facility record drawings

Domain 4: Safety and Regulations

Sub-Domain 4.1:

Safety policies and procedures

1. Ensure that the safety program requirements are implemented and carried out
2. Identify, investigate, and resolve safety incidents, accidents, injuries, and near misses on the job
3. Oversee the lockout / tagout program and ensure that all proper procedures are followed
4. Assist in the development of the collection system safety policies and procedures
5. Understand the hazards associated with collection systems operation, maintenance, and repair

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 dangerous gases
2. Knowledge of safety equipment and procedures related to confined space entry
3. Ensure that all necessary equipment is available for confined space entry
4. Assess when equipment needs to be replaced or repaired
5. Ensure personal protective equipment (PPE) is available and in good condition

Sub-Domain 4.3:

Underground Service Alert

1. Ensure all Underground Service Alert (USA) markings for sewer assets are done in a timely and accurate manner
2. Ensure all Underground Service Alert (USA) locate requests have been received and processed

Sub-Domain 4.4:

Traffic control practices and requirements

1. Assist in the development and oversee the execution of complex or non-routine traffic plans under the California Manual on Uniform Traffic Control Devices for Streets & Highways (MUTCD)
2. Oversee and evaluate the setup of traffic control devices
3. Working knowledge of all pertinent personal protective equipment (PPE) and devices in accordance with traffic control

Sub-Domain 4.5:

Safety regulations

1. Working knowledge of safety data sheet (SDS) program
2. Knowledge of pertinent federal, state, and local laws, codes, and regulations
3. Ensure all applicable Cal-OSHA procedures are enforced

Sub-Domain 4.6:

Environmental protection regulations

1. General knowledge of Statewide General Waste Discharge Requirements (WDR) for sanitary sewer systems
2. General knowledge of Sewer System Management Plan (SSMP) requirements per the WDR
3. General 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 specialized collection systems records, forms, and reports to regulatory agencies and management
2. Prepare analytical and statistical reports on operations and activities
3. Report on the condition of assets
4. Oversee maintenance of permit, easement, as-built, and blueprint records
5. Research property connection history as necessary

Sub-Domain 5.2:

Customer service and communication

1. Investigate and resolve complaints related to collection system maintenance and repair
2. Interact with the public to resolve property damage claims
3. Coordinate operations with the needs of the public and outside agencies
4. Ensure property owners are notified of service interruptions and are provided with information regarding the work being performed
5. Communicate effectively with state and local agencies regarding problems with the collection system
6. 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 instruct personnel
2. Assist in onboarding new personnel
3. Plan, prioritize, assign, and review work of staff responsible for the clearing and cleaning of the collection system
4. Provide leadership and technical assistance, especially on difficult or unusual problems
5. Identify safety and training needs and assist in the development of training plans
6. Participate in the investigations of violations of employer policies or agency ordinances

Sub-Domain 5.4:

Policies and procedures

1. Ensure compliance with established policies and procedures as required by agency management
2. Participate in the development of policies and procedures and make recommendations for changes and improvements to existing standards and procedures

Sub-Domain 5.5:

Planning, budgeting, and data analysis

1. Assist in scheduling, coordinating, monitoring, and reporting of collection system maintenance and repair activities
2. Develop and apply performance measures and ensure that performance measures are tracked and met

3. Identify and implement process improvements
4. Utilize the Computerized Maintenance Management System (CMMS) to monitor and report on work activities
5. Assist with the preparation and administration of the annual budget and work plan
6. Forecast funding, staffing, equipment, and material needs
7. Use cost effective methods to maintain the collection system
8. Estimate necessary materials, supplies, and equipment to complete projects
9. Assist in fact-gathering to respond to claims

Domain 6: Math for Collection Systems

Sub-Domain 6.1:

Basic math used in collection systems maintenance

1. Calculate volume
2. Calculate area
3. Calculate gross vehicle weight rating (GVWR)
4. Calculate flow rate
5. Calculate velocity
6. Calculate elevation
7. Complete SSO-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 – Systems Operations, Inspections, and Maintenance	
Sub-Domain 1.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 224-296, 302-404 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 461-470, 555-585, 620-627 Wastewater Collection Systems Management. Water Environment Federation
Sub-Domain 1.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 224-229 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 11-114, 563-566, 629-631 State Water Resources Control Board Order No. WQ 2013-0058-EXEC Enrollee's Guide to the SSO Database: Sanitary Sewer Overflow Reduction Program, August 2013, State Water Resources Control Board State Water Resources Control Board Order No. 2006-0003-DWQ
Domain 2 – Collection Systems Tools and Equipment	
Sub-Domain 2.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 365-370 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 153-253, 563-566, 629-631
Sub-Domain 2.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 365-370 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 153-253, 451-456, 495-503, 563-566, 629-631

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 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 461-470, 502-507, 616-619
Sub-Domain 3.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 22-83 Wastewater Collection Systems Management. Water Environment Federation
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, 7th Edition. Pages 341-376, 443-444 Utility Management, A Field Study Training Program, 2nd Edition. Pages 39-47 Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 357-385 California Code of Regulations, Title 8, Section 3314(h)
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, 7th Edition. Pages 358-366 Confined Space Guide for General Industry, May 2019. State of California Department of Industrial Relations
Sub-Domain 4.3	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 178-181, 416-469
Sub-Domain 4.4	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 94-134 Watchbook: Work Area Traffic Control Handbook, 2019, 14th Edition
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, 7th Edition. Pages 627-632

	Utility Management, A Field Study Training Program, 2nd Edition. Pages 39-47 Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 357-385 Title 29 CFR 1910.25
Sub-Domain 4.6	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 9-16 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 627-632 Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 253-279 State Water Resources Control Board Order No. WQ 2013-0058-EXEC State Water Resources Control Board Order No. R2-2015-0049
Domain 5 – Administration of Collection Systems	
Sub-Domain 5.1	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 508-516, 620-627 Utility Management, A Field Study Training Program, 2nd Edition. Pages 47-49
Sub-Domain 5.2	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 519-522 Utility Management, A Field Study Training Program, 2nd Edition. Pages 26-28 Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 387-400 Enrollee's Guide to the SSO Database: Sanitary Sewer Overflow Reduction Program, August 2013, State Water Resources Control Board
Sub-Domain 5.3	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 2-17, 440-441, 614 Utility Management, A Field Study Training Program, 2nd Edition. Pages 1-3, 6-21, 31-33 Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 10-55, 172-196
Sub-Domain 5.4	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 425-460, 507-519, 537-550, 568-572, 608-632

	Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 101-131, 131-169
Sub-Domain 5.5	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 425-430, 507-519, 539-572, 568-572, 608-637 Utility Management, A Field Study Training Program, 2nd Edition. Pages 1-3, 28-31, 31-33 Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 131-169, 279-307, 307-337, 337-357 Wastewater Collection Systems Management. Water Environment Federation
Domain 6 – Math for Collection Systems	
Sub-Domain 6.1	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 449-556

Publications in the Suggested Reference List

- California Code of Regulations Title 8
  - Section 3314(h)
- Confined Space Guide for General Industry, May 2019. State of California Department of Industrial Relations
- Enrollee's Guide to the SSO Database: Sanitary Sewer Overflow Reduction Program, August 2013, State Water Resources Control Board
- Manage for Success, Effective Utility Leadership Practices, 1st Edition. Office of Water Programs
- Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition, Office of Water Programs
- Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition, Office of Water Programs
- State Water Resources Control Board Order No. 2006-0003-DWQ
- State Water Resources Control Board Order No. WQ 2013-0058-EXEC
- State Water Resources Control Board Order No. R2-2015-0049
- Title 29 CFR
  - 1910.25
- Utility Management, A Field Study Training Program, 2nd Edition. Office of Water Programs
- Wastewater Collection Systems Management. Water Environment Federation
- Watchbook: Work Area Traffic Control Handbook, 2019, 14th Edition, Bni Building News

Sample Questions

1. Liners are installed in sewers to correct problems caused by
    a. grade alignment.
    b. grease.
    c. grit.
    d. infiltration.
2. Why is the replacement of wastewater collection systems in some downtown streets difficult?
    a. Crowding of other underground utilities
    b. Records have not been maintained properly and the collection system is lost
    c. Some people have landscaped their backyards over the collection system and do not want their yards dug up.
    d. The streets will have to be paved again
3. If the camera becomes wedged during a video inspection, which of the following would be your first step in solving the problem?
    a. Dig up the area where the camera is wedged
    b. Attempt to free the camera with the tag line
    c. Attach pull cable to a backhoe and pull is out
    d. Wait awhile to see if it will free itself
4. Drawings which are considered “As Built” would be?
    a. Construction drawings issued to the contractor
    b. Corrected construction drawings showing changes made in the field installation
    c. Detailed drawings of proposed construction
    d. Sectional maps on file
5. When a grade conflict exists between a water main and a sewer main, which of the following is the best solution?
    a. Build a manhole around the sewer main and continue the water main through the manhole
    b. Drop the sewer service under the water main and let it work like a siphon
    c. Have the water main adjusted and hold the grade on the sewer main
    d. Raise the sewer over the water main and install a sewer pump station
6. A flagger should stand
    a. on the shoulder adjacent traffic being controlled.
    b. in the closed lane before stopping vehicle traffic.
    c. in the traffic lane.
    d. as stated in "a" or "b" above.

7. Under what conditions must each member of the rescue service practice permit space rescues?
    a. At least once a year in a simulated situation or by the satisfactory performance of an actual rescue
    b. At least twice a year in simulated situations
    c. At least once a year in simulated situation using non-representative space conditions
    d. At least four times a year
8. Legally responsible officials are required to report category 1 Sanitary Sewer Overflows (SSOs)
    a. within 30 days.
    b. before the end of the day.
    c. as soon as possible.
    d. within 2 hours.
9. Planning which covers a period of five to fifteen years is called
    a. scheduling.
    b. long range.
    c. updating.
    d. future modeling.
10. A 6-inch pipe has a flow with a velocity of 2.6 fps. What is the gpm flow rate through the pipeline? Assume the pipe is flowing full.
    a. 125 gpm
    b. 220 gpm
    c. 225 gpm
    d. 229 gpm
11. A new sewer line is installed using a bubble level and a quarter inch (¼") of fall for every foot measured. Calculate the slope in percentage?
    a. 4%
    b. 1.4%
    c. 2%
    d. 0.002%

Answer Key and Solutions

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

    Solution: Calculate the flow rate based on the flow rate velocity relationship

    $$Q\left[\frac{gal}{\min}\right]=v\left[\frac{ft}{s}\right]\times A\left[ft^2\right]\times\frac{60\,s}{\min}\times\frac{7.48\,gal}{ft^3}$$

    Step 1 – calculate the cross-sectional area

    $$A\left[ft^2\right]=\frac{\pi}{4}\times D^2\left[in^2\right]\times\frac{ft^2}{12^2\,in^2}=0.785\times 6^2\left[in^2\right]\times\frac{ft^2}{12^2\,in^2}=0.196\,ft^2$$

    Step 2 – calculate the flow rate in gallons per minute

    $$Q\left[\frac{gal}{\min}\right]=v\left[\frac{ft}{s}\right]\times A\left[ft^2\right]\times\frac{60\,s}{\min}\times\frac{7.48\,gal}{ft^3}$$
    $$=2.6\left[\frac{ft}{s}\right]\times 0.196\left[ft^2\right]\times\frac{60\,s}{\min}\times\frac{7.48\,gal}{ft^3}=228.7\approx 229\,\frac{gal}{\min}$$

11. C – Domain 6

    Solution: Convert the ¼ of an inch into feet

    $$d\left[ft\right]=d\left[in\right]\times\frac{ft}{12\,in}=\frac{1}{4}\left[in\right]\times\frac{ft}{12\,in}=.021\,ft$$

    Calculate the slope in percentage

    $$S\left[\%\right]=\frac{d\left[ft\right]}{x\left[ft\right]}\times 100\%=\frac{0.021\left[ft\right]}{1\left[ft\right]}\times 100\%=2.1\%$$

CSM GRADE 4 EXAM CONTENT OUTLINE

Content Domain	Weighting
Domain 1 – Systems Operations, Inspections, and Maintenance	35%
Domain 2 – Administration of Collection Systems	35%
Domain 3 – Safety and Regulations	30%
Total	100%

Domain 1: Systems Operations, Inspections, and Maintenance

Sub-Domain 1.1:

Preventive / routine maintenance, cleaning, and repair of sewer system

1. Plan, direct, coordinate, prioritize, and review the work plan for the collection system
2. Coordinate and schedule routine maintenance and daily cleaning of the collection system
3. Knowledge of practices and procedures related to the installation and repair of sewer mains, laterals, clean-outs, and manholes, including trenching and shoring practices
4. Identify service areas and locations of sewer facilities and equipment
5. Recognize the principles of Sewer System Hydraulic Modeling
6. Analyze complex collection system maintenance problems, evaluate alternatives, and recommend the most effective course of action

Sub-Domain 1.2:

Inspections and CCTV

1. Oversee and enforce standards and specifications of the construction of sewer lines
2. Oversee detailed inspection of the collection system using video equipment and other tools and techniques
3. Ensure maintenance of logs and records of inspections conducted

4. Develop pipe replacement and capital improvement projects (CIP) using CCTV

Sub-Domain 1.3:

Equipment

1. Understand and skillfully use tools, materials, and equipment used in maintaining collection systems
2. Advanced knowledge of how to diagnose, disassemble, and repair collection system equipment
3. Develop, implement, oversee, approve, and make recommendations for collection system equipment selection and maintenance program
4. Research and recommend purchase of equipment, parts, suppliers, and costs

Sub-Domain 1.4:

Sanitary Sewer Overflows (SSOs) and emergency response

1. Oversee the process of containment and clean-up of spills emanating from the collection system
2. Certify all CIWQS reports
3. Complete and update CIWQS system survey
4. Develop, evaluate, maintain, and update as required the SSO Emergency Response Plan (SSO ERP)

Domain 2: Administration of Collection Systems

Sub-Domain 2.1:

Budgeting

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

Sub-Domain 2.2:

Management and planning

1. Evaluate job sites and determine personnel, equipment, and material needs
2. Coordinate with Plant Operators for major repairs, equipment installation, special maintenance activities, and any anticipated flow changes or conditions

3. Knowledge of development review process and plan checking process
4. Originate and administer the work of contractors, consultants, and engineers for a variety of collection system construction and/or maintenance projects
5. Direct and participate in the development and implementation of goals, objectives, policies, and procedures
6. Oversee the use of GIS mapping systems in collection system maintenance and operations
7. Manage Computerized Maintenance Management System (CMMS) and its use in scheduling, preventative maintenance, repair activities, and purchasing
8. Prepare concise 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. Provide responsible and complex technical support to upper management and prepare/present staff reports including organizational studies

Sub-Domain 2.3:

Supervision and training

1. Assign, evaluate, and supervise the work of collection system maintenance workers
2. Ensure completion of assigned duties for appropriate quality and timeliness
3. Knowledge of principles and practices of effective leadership and employee supervision, including training and performance evaluation
4. Develop and implement standard operating procedures (SOPs) and work standards
5. Motivate staff and work with employees to achieve performance goals and objectives
6. Implement disciplinary procedures and conduct general labor relations activities
7. Develop and maintain the training plan for all collection system staff
8. Participate in the hiring process

Sub-Domain 2.4:

Public relations and customer service

1. Respond to and resolve difficult and sensitive public inquiries and complaints in a professional and courteous manner
2. Develop formal responses to the media
3. Assist in public relations programs
4. Direct and support supervisors and staff to ensure high performance in a customer service-oriented work environment

5. Negotiate and resolve collection system operational issues that involve other utilities, agencies, private organizations, bargaining units, government entities, and the general public to address complex or non-routine issues

Domain 3: Safety and Regulations

Sub-Domain 3.1:

Safety

1. Develop, review, and ensure compliance with all applicable safety procedures (IIPP, confined space, traffic control, bloodborne pathogens)
2. Document and report all accidents, violations, or infractions to required entity
3. Develop and administer safety training programs and policies for collection system staff
4. Develop and direct the execution of complex or non-routine traffic safety plans under the California Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)
5. Develop, review, and approve safety tailgate meetings

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. Knowledge and implementation of Statewide General Waste Discharge Requirements (WDR) and the Monitoring and Reporting Plan

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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Sub-Domain 1.2	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 224-226 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 461-470, 555-585, 620-627
Sub-Domain 1.3	Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition. Pages 365-370 Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 153-253, 563-566, 629-631 Collection Systems: Methods for Evaluating and Improving Performance, 3rd Edition.
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, 7th Edition. Pages 11-114, 563-566, 629-631

	State Water Resources Control Board Order No. WQ 2013-0058-EXEC Enrollee's Guide to the SSO Database: Sanitary Sewer Overflow Reduction Program, August 2013, State Water Resources Control Board
Domain 2 – Administration of Collection Systems	
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Sub-Domain 2.2	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 425-460, 508-572, 620-627 Utility Management, A Field Study Training Program, 2nd Edition. Pages 1-3, 28-31, 31-33 Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 131-169, 279-307, 307-337, 337-357 California Code of Regulations, Title 8, Section 5141.1
Sub-Domain 2.3	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 2-17, 440-441, 614 Utility Management, A Field Study Training Program, 2nd Edition. Pages 1-3, 6-21, 31-33 Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 10-55, 172-196
Sub-Domain 2.4	Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition. Pages 519-522 Utility Management, A Field Study Training Program, 2nd Edition. Pages 26-28 Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 387-400 Wastewater Collection Systems Management. Water Environment Federation

Domain 3 – Safety and Regulations	
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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, 7th Edition. Pages 627-632 Manage for Success, Effective Utility Leadership Practices, 1st Edition. Pages 253-279 California Code of Regulations, Title 8, Section 5144 Enrollee's Guide to the SSO Database: Sanitary Sewer Overflow Reduction Program, August 2013, State Water Resources Control Board Sanitary Sewer Overflow Reduction Program State Water Resources Control Board Order No. 2006-0003-DWQ State Water Resources Control Board Order No. WQ 2013-0058-EXEC A Guide for Developing and Updating of Sewer System Management Plans (SSMPs)

Publications in the Suggested Reference List

- A Guide for Developing and Updating of Sewer System Management Plans (SSMPs), September 2015.
- California Code of Regulations Title 8
  - Section 1541.1
  - Section 3203
  - Section 5157
  - Section 5144
- Cal/OSHA Form 300A
- Collection Systems: Methods for Evaluating and Improving Performance, 3rd Edition. Office of Water Programs
- Enrollee's Guide to the SSO Database: Sanitary Sewer Overflow Reduction Program, August 2013, State Water Resources Control Board
- Heat Illness Prevention website
- Operation and Maintenance of Wastewater Collection Systems, Volume 1, 8th Edition, Office of Water Programs
- Operation and Maintenance of Wastewater Collection Systems, Volume 2, 7th Edition, Office of Water Programs
- Recommended Practices for Safety and Health Programs
- Sanitary Sewer Overflow Reduction Program
- State Water Resources Control Board Order No. 2006-0003-DWQ
- State Water Resources Control Board Order No. WQ 2013-0058-EXEC
- Title 29 CFR
  - 1910.146
- The Worker Occupational Safety and Health Training and Education Program – IIPP information page

Sample Questions

1. In selecting pipe material for maximum service life, which factor is most important?
    a. Ease of installation
    b. Initial cost
    c. Life expectancy of pipe
    d. Local manufacturer
2. If the sewer rate is $5.50 for the first 500 cubic feet and all use over the minimum is billed at the rate of 25 cents per 100 cubic feet, how much would a customer discharging 1,200 cubic feet be billed?
    a. $5.25
    b. $6.25
    c. $6.75
    d. $7.25
3. What affects the flow capacity of a sewer line?
    a. Backfill material, manhole spacing, pipe size
    b. Burial depth, size, manhole spacing
    c. Pipe material, manhole rim elevation, pipe size
    d. Pipe size, pipe material, grade
4. If you were supervisor of two lead workers, one whose work was exceptionally good and a second whose work was substandard, what should you do?
    a. Demote the substandard foreman and bring up a replacement from the ranks
    b. Discuss the problem with the substandard foreman and offer to help before any other action is taken
    c. Find a replacement and then fire the substandard foreman
    d. Wait to see if the substandard foreman does better
5. As the Division Manager you receive a request from your Board or Council and they want an immediate response. You do not know all the answers. You should
    a. wait until you have the answer and respond.
    b. respond with the information available and update them with more.
    c. tell them what you think they need to hear.
    d. respond with all the answers and results that you think are important.
6. Your system's billing is based on the water usage rate. If your system bills quarterly at a rate of 50 cents/1,000 gallons for the first 10,000 gallons, $0.41/1,000 for the next 15,000 gallons and $0.25/ 1,000 for all over 25,000 gallons. If a customer uses 35,000 gallons per quarter, what is the bill?
    a. $11.00
    b. $13.65

c. $21.75
d. $27.15

7. What factor must be considered when obtaining an easement for construction and maintenance of a collection system?
    a. Compaction
    b. Deposition of cut materials
    c. Access for equipment and personnel
    d. Manhole headroom
8. What are the basic elements of a safety program?
    a. Accident investigation, injury frequency rates, safety policy statement
    b. Injury frequency rates, safety policy statement, safety training
    c. Lost time accident statistics, injury frequency rates, accident investigation
    d. Safety policy statement, safety training, accident investigation
9. Providing a plan and schedule to properly manage, operate and maintain all parts of the sanitary sewer system is the goal of
    a. a Sanitary Sewer Overflow Response Plan.
    b. an Emergency Response Plan.
    c. a Sewer System Management Plan.
    d. a Sanitary Sewer Management Plan.
10. In order to accurately estimate the volume of a Sanitary Sewer Overflow (SSO) you must have
    a. spill start time, spill end time and spill rate.
    b. spill rate, spill location, spill source.
    c. spill duration, surface type, spill source.
    d. spill start time, spill end time, surface type.

Answer Key and Solutions

1. C – Domain 1
2. D – Domain 1

   Solution: Estimate the volume over the minimum

   $$V_{over}\left[ft^3\right] = V_{total}\left[ft^3\right] - V_{\text{minimum}}\left[ft^3\right] = 1,200\left[ft^3\right] - 500\left[ft^3\right] = 700\,ft^3$$

   Estimate total cost

   $$\text{Cost}_{total}\left[\$\right] = \text{Cost}_{base}\left[\$\right] + V_{excess}\left[ft^3\right] \times rate\left[\frac{\$}{ft^3}\right]$$

   $$= 5.25\left[\$\right] + 700\left[ft^3\right] \times 0.25\left[\frac{\$}{100\,ft^3}\right] = 5.25\left[\$\right] + 1.75\left[\$\right] = \$7.00$$

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

   Solution: Calculate the volume of tier 2 in excess of 25,000 gallons

   $$V_{tier2}\left[gal\right] = V_{total}\left[gal\right] - V_{base2}\left[gal\right] = 35,000\left[gal\right] - 25,000\left[gal\right] = 10,000\,gal$$

   Calculate total cost

   $$\text{Cost}_{total}\left[\$\right] = V_{base}\left[gal\right] \times rate_{base}\left[\frac{\$}{1,000\,gal}\right] + V_{tier1}\left[gal\right] \times rate_{1}\left[\frac{\$}{1,000\,gal}\right] + V_{tier2}\left[gal\right] \times rate_{2}\left[\frac{\$}{1,000\,gal}\right]$$

   $$= 10,000\left[gal\right] \times 0.50\left[\frac{\$}{1,000\,gal}\right] + 15,000\left[gal\right] \times 0.41\left[\frac{\$}{1,000\,gal}\right] + 10,000 \times 0.25\left[\frac{\$}{1,000\,gal}\right]$$

   $$= 5\left[\$\right] + 6.15\left[\$\right] + 2.5\left[\$\right] = \$13.65$$

7. C – Domain 2
8. D – Domain 3
9. C – Domain 3
10. A – Domain 3

FORMULA SHEET

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 = AV	Q = Flow A = Area V = Velocity
Area Rectangle: A = LW Circle: A = $0.785D^2$	L = Length W = Width D = Diameter A = Area
Circumference of a circle C = 3.14D	C = Circumference D = Diameter
Volume Rectangle Solid: Vol = LWd Cylinder: Vol = $0785D^2L$ **OR** $3.14R^2L$	Vol = Volume d = Depth D = Diameter W = Width L = Length
Distance $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	**Slope** $\frac{\text{Rise}}{\text{Run}}$ = 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.

TEST SITE INFORMATION

Test Site Admission

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.

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 *except* 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 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. 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.

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. 77).

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 $25 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. 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. 78).

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 $25 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.

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. 81).

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.

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. Most exam items are valued at 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 the number of candidates examined, pass/fail statistics, and the number of individuals currently certified. To request this information, please contact the CWEA office.