

ABC Need-to-Know Criteria for Collection Operators



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ABC

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Introduction

As part of the development of its certification exams, the Association of Boards of Certification (ABC) conducted a job analysis of collection system operators in 2000. As part of this process, ABC conducted a national survey of collection operators. In 2002 and 2003, ABC's Collection Validation and Examination (V&E) Committee re-evaluated the results of the job analysis. This Need-to-Know Criteria was developed from the results of the re-evaluation of ABC's 2000 collection operator job analysis.

For wastewater collection, Ontario uses the Canadian Standardized Exams. These exams are reviewed and set by Canadian subject matter experts based on the Need-To-Know Criteria. Please note that there may be minor differences in content between this Need-to-Know and the exams used in Ontario. This difference is largely due to difference in legislation and/or common operating practices.

How the Need-to-Know Criteria was Developed

Review of Task Survey

The results of the 2000 task survey were provided to the ABC Collection V&E Committee. In the task survey, operators rated job tasks and capabilities for frequency of performance and seriousness of inadequate or incorrect performance. These two rating scales were used because they provide useful information (i.e., how critical each task is and how frequently each task is performed) pertaining to certification. Of the 112 operators who completed the survey, 24% were class I operators, 36% were class II operators, 24% were class III operators, and 16% were class IV operators.

Committee Ratings

The Collection V&E Committee met in October 2002 to begin development of the new Need-to-Know Criteria. During their meeting, the committee rated the job tasks and capabilities found in the job analysis as essential, useful or not need-to-know and identified the level of knowledge (i.e., comprehension, application, analysis) required by operators for each task.

Analysis of Ratings

The committee ratings were combined with the operator ratings from the task survey to form a composite criticality rating. The composite criticality ratings and percentage of operators reporting that they performed the tasks were used to determine what is covered on each level of certification exam.

Core Competencies

The essential tasks and capabilities that were identified through this process are called the core competencies. The following pages list the core competencies for collection operators. The core competencies are clustered into the following job duties:

- Operate Equipment
- Evaluate and Maintain Equipment
- Maintain and Restore Collection System
- Maintain Lift Stations
- Monitor, Evaluate and Adjust Collection System
- Perform Security, Safety and Administrative Procedures

The level of knowledge (i.e., comprehension, application, analysis) required for each task is also identified in the following pages.

- **Comprehension** is the most basic level of understanding and remembering. Items written at the comprehension level require examinees to recognize, remember, or identify important ideas.
- Items written at the **application** level require examinees to interpret, calculate, predict, use or apply information and solve problems.

- Items written at the **analysis** level require examinees to compare, contrast, diagnose, examine, analyze, and relate important concepts.

The level of knowledge is a hierarchy from basic comprehension to analysis. The level of knowledge tested is cumulative. Therefore, tasks identified as application may include questions written at both the application and comprehension levels. Tasks identified as analysis may include questions written at the comprehension, application and analysis levels.

Core Competencies for Collection Operators

Operate Equipment	Class I	Class II	Class III	Class IV
Atmospheric testing equipment	Comprehension	Comprehension	Application	Application
Blowers	Comprehension	Comprehension	Application	Application
Boring equipment		Comprehension	Comprehension	Comprehension
Cathodic protection devices	Comprehension	Comprehension	Application	Application
Chemical feeders	Comprehension	Comprehension	Comprehension	Application
Cleaning equipment (rodders, bucket machines)	Comprehension	Application	Analysis	Analysis
Computers	Comprehension	Comprehension	Application	Analysis
Electrical controls	Application	Application	Application	Application
Engines	Application	Application	Application	Application
Excavating equipment	Application	Application	Application	Application
Flow monitoring equipment	Comprehension	Comprehension	Application	Application
Generators	Application	Application	Application	Application
Heavy vehicles	Application	Application	Application	Application
High-velocity cleaners	Application	Application	Analysis	Analysis
Inspection equipment (TV, vacuum testing, pressure testing)	Comprehension	Comprehension	Application	Application
Motors and pumps	Application	Application	Application	Application
Power and hand tools	Application	Application	Application	Application
Safety equipment	Application	Application	Application	Application
Screening equipment	Comprehension	Comprehension	Application	Application
Tapping equipment	Application	Application	Application	Application
Valves	Application	Application	Application	Application
Variable speed drives	Application	Application	Application	Application

Required Capabilities:

- Ability to monitor, evaluate and adjust equipment
- Knowledge of function of tools
- Knowledge of general electrical and mechanical principles
- Knowledge of general hydraulic principles
- Knowledge of regulations
- Knowledge of safety procedures
- Knowledge of start-up and shut-down procedures
- Knowledge of system operation and maintenance
- Knowledge of wastewater treatment concepts

Core Competencies (continued)

Evaluate and Maintain Equipment	Class I	Class II	Class III	Class IV
Evaluate operation of equipment:				
Inspect equipment for abnormal conditions	Analysis	Analysis	Analysis	Analysis
Read charts	Comprehension	Comprehension	Analysis	Analysis
Read meters	Analysis	Analysis	Analysis	Analysis
Read pressure gauges	Analysis	Analysis	Analysis	Analysis
Troubleshoot electrical equipment	Analysis	Analysis	Analysis	Analysis
Perform maintenance:				
Blowers	Comprehension	Comprehension	Comprehension	Comprehension
Chemical feeders	Comprehension	Comprehension	Comprehension	Comprehension
Cleaning equipment (rodders, bucket machines)	Comprehension	Comprehension	Comprehension	Comprehension
Electrical controls	Comprehension	Comprehension	Comprehension	Comprehension
Engines	Comprehension	Comprehension	Comprehension	Comprehension
Excavating equipment	Comprehension	Comprehension	Comprehension	Comprehension
Generators	Comprehension	Comprehension	Comprehension	Comprehension
Heavy vehicles	Comprehension	Comprehension	Comprehension	Comprehension
High-velocity cleaners	Comprehension	Comprehension	Analysis	Analysis
Inspection equipment (TV, vacuum testing, pressure testing)	Comprehension	Comprehension	Analysis	Analysis
Motors	Comprehension	Comprehension	Comprehension	Comprehension
Pumps	Application	Application	Analysis	Analysis
Safety equipment	Application	Application	Application	Application
Valves	Comprehension	Comprehension	Comprehension	Comprehension
Variable speed drives	Comprehension	Comprehension	Analysis	Analysis

Required Capabilities:

- Ability to assign work to proper trade
- Ability to calibrate equipment
- Ability to diagnose/troubleshoot units
- Ability to differentiate between preventive and corrective maintenance
- Ability to discriminate between normal and abnormal conditions
- Ability to evaluate and adjust equipment
- Ability to follow written procedures
- Ability to order necessary spare parts
- Ability to perform general maintenance
- Ability to record information
- Knowledge of general electrical and mechanical principles
- Knowledge of general hydraulic principles
- Knowledge of instrumentation
- Knowledge of lubricant and fluid characteristics
- Knowledge of pipe fittings and joining methods
- Knowledge of piping material, type and size
- Knowledge of safety regulations
- Knowledge of start-up and shut-down procedures
- Knowledge of system operation and maintenance

Core Competencies (continued)

Maintain and Restore Collection System	Class I	Class II	Class III	Class IV
Clean system:				
Bucket machine	Comprehension	Application	Analysis	Analysis
Hydraulic cleaning (balling, flushing, poly pig)	Comprehension	Comprehension	Comprehension	Comprehension
Jet rodding	Application	Application	Analysis	Analysis
Pigging	Comprehension	Comprehension	Analysis	Analysis
Remove stoppage	Application	Application	Analysis	Analysis
Rodding	Application	Application	Analysis	Analysis
Root control	Application	Application	Analysis	Analysis
Inspect system:				
Dye testing	Comprehension	Comprehension	Comprehension	Comprehension
Mandrel testing	Comprehension	Comprehension	Comprehension	Comprehension
Physical inspection	Application	Application	Application	Application
Pressure testing	Comprehension	Comprehension	Comprehension	Comprehension
Smoke testing	Comprehension	Comprehension	Comprehension	Comprehension
Televising	Comprehension	Comprehension	Analysis	Analysis
Vacuum testing	Comprehension	Comprehension	Comprehension	Comprehension
Rehabilitate and repair:				
Manholes	Application	Application	Analysis	Analysis
Lift station fitting and piping	Application	Application	Analysis	Analysis
Sewer lines	Application	Application	Analysis	Analysis
Taps	Application	Application	Analysis	Analysis

Required Capabilities:

- Ability to assign work to proper trade
- Ability to calibrate equipment
- Ability to diagnose/troubleshoot units
- Ability to differentiate between preventive and corrective maintenance
- Ability to discriminate between normal and abnormal conditions
- Ability to evaluate data and identify cause of damage/problems
- Ability to follow written procedures
- Ability to identify different types of blockages and determine the most effective way to clear that type of blockage
- Ability to order necessary spare parts
- Ability to perform general maintenance
- Ability to read plans and profiles
- Ability to record information
- Knowledge of excavation techniques
- Knowledge of function of tools
- Knowledge of general electrical and mechanical principles
- Knowledge of general hydraulic principles
- Knowledge of lubricant and fluid characteristics
- Knowledge of pipe fittings and joining methods
- Knowledge of pipe line construction principles
- Knowledge of piping material, type and size
- Knowledge of procedures for detection and correction of infiltration, inflow and exfiltration
- Knowledge of regulations and standards
- Knowledge of safety regulations
- Knowledge of start-up and shut-down procedures
- Knowledge of system operation and maintenance
- Knowledge of trenchless technologies (pipe-bursting, slip-lining)

Core Competencies (continued)

Maintain Lift Stations	Class I	Class II	Class III	Class IV
Electrical:				
Fuses	Application	Application	Analysis	Analysis
Generators	Application	Application	Analysis	Analysis
Motors	Application	Application	Analysis	Analysis
Relays	Application	Application	Analysis	Analysis
Starters	Application	Application	Analysis	Analysis
Electronic:				
Alarms	Application	Application	Analysis	Analysis
Controllers	Application	Application	Analysis	Analysis
Gas detection	Application	Application	Analysis	Analysis
Level detection system	Application	Application	Analysis	Analysis
RTU (remote transmitting units)	Application	Application	Analysis	Analysis
Mechanical:				
Blowers and compressors	Application	Application	Analysis	Analysis
Engines	Application	Application	Analysis	Analysis
Generators	Application	Application	Analysis	Analysis
Piping	Application	Application	Analysis	Analysis
Pressure relief valves	Application	Application	Analysis	Analysis
Pretreatment	Application	Application	Analysis	Analysis
Pumps	Application	Application	Analysis	Analysis
Screens	Application	Application	Analysis	Analysis
Valves	Application	Application	Analysis	Analysis
Wet wells	Application	Application	Analysis	Analysis

Required Capabilities:

- Ability to discriminate between normal and abnormal conditions
- Ability to monitor, evaluate and adjust equipment
- Knowledge of general electrical and mechanical principles
- Knowledge of hazardous situations
- Knowledge of instrumentation
- Knowledge of types of pumps
- Knowledge of variable frequency drives and programmable logic controllers

Core Competencies (continued)

Monitor, Evaluate, and Adjust Collection System	Class I	Class II	Class III	Class IV
Cross-connections	Comprehension	Comprehension	Comprehension	Comprehension
Flow	Comprehension	Comprehension	Analysis	Analysis
Force mains	Analysis	Analysis	Analysis	Analysis
Gravity sewers	Analysis	Analysis	Analysis	Analysis
Infiltration/inflow/exfiltration	Comprehension	Comprehension	Analysis	Analysis
Lift stations	Analysis	Analysis	Analysis	Analysis
Manholes	Analysis	Analysis	Analysis	Analysis
Measuring and control systems	Analysis	Analysis	Analysis	Analysis
Odour control	Comprehension	Comprehension	Application	Application
Pressure sewers (S.T.E.P.)	Analysis	Analysis	Analysis	Analysis
Vacuum sewers	Analysis	Analysis	Analysis	Analysis

Required Capabilities:

- Ability to diagnose/troubleshoot units
- Ability to identify types of pipe, pipe joints, valves, manholes, cleanouts, inverted siphons, diversion structures, catch basins, and backflow prevention devices
- Ability to maintain system in normal operating condition
- Ability to perform mathematical calculations and physical measurements
- Ability to read and use maps
- Knowledge of characteristics of sanitary, storm and combined systems
- Knowledge of general electrical principles and hydraulic principles
- Knowledge of hydrogen sulphide and methane generation
- Knowledge of influent characteristics
- Knowledge of principles of building sewers, service laterals, branch sewers, main sewers, trunk sewers, interceptors, and outfalls
- Knowledge of regulations
- Knowledge of wet wells and dry wells

Core Competencies (continued)

Perform Security, Safety and Administrative Procedures	Class I	Class II	Class III	Class IV
Perform security and safety procedures related to:				
Confined space entry	Analysis	Analysis	Analysis	Analysis
Electrical hazards	Analysis	Analysis	Analysis	Analysis
Excavation	Analysis	Analysis	Analysis	Analysis
Fire safety	Analysis	Analysis	Analysis	Analysis
Hazardous material	Analysis	Analysis	Analysis	Analysis
Infectious disease	Analysis	Analysis	Analysis	Analysis
Lock-out/tag-out	Analysis	Analysis	Analysis	Analysis
Manhole hazards	Analysis	Analysis	Analysis	Analysis
Personal protective equipment	Analysis	Analysis	Analysis	Analysis
Shoring	Analysis	Analysis	Analysis	Analysis
System failure	Analysis	Analysis	Analysis	Analysis
Traffic/work zone	Analysis	Analysis	Analysis	Analysis
Trenching	Analysis	Analysis	Analysis	Analysis
Perform administrative procedures, such as:				
Administer compliance, emergency preparedness and safety program	Application	Application	Analysis	Analysis
Develop budget	Application	Application	Analysis	Analysis
Develop operation and maintenance plan	Application	Application	Analysis	Analysis
Plan and organize work activities	Application	Application	Analysis	Analysis
Record and evaluate data	Application	Application	Analysis	Analysis
Respond to complaints	Application	Application	Analysis	Analysis
Write regulatory authority reports	Application	Application	Analysis	Analysis

Required Capabilities:

- Ability to assess likelihood of disaster occurring
- Ability to communicate verbally and in writing
- Ability to conduct design reviews
- Ability to coordinate emergency response with other organizations
- Ability to generate written policies and procedures
- Ability to interpret and transcribe data
- Ability to interpret Material Safety Data Sheets
- Ability to organize information and review reports
- Ability to perform basic math
- Ability to recognize unsafe work conditions/safety hazards
- Ability to select and operate safety equipment
- Ability to translate technical language into common terminology
- Knowledge of benchmarking
- Knowledge of construction management
- Knowledge of emergency plans
- Knowledge of local codes and ordinances
- Knowledge of monitoring and reporting requirements
- Knowledge of potential causes and impact of system disasters
- Knowledge of principles of finance
- Knowledge of principles of management
- Knowledge of principles of public relations
- Knowledge of principles of vulnerability assessments
- Knowledge of public health threats from sanitary sewer overflows
- Knowledge of recordkeeping functions and policies
- Knowledge of regulations
- Knowledge of risk management
- Knowledge of safety procedures
- Knowledge of system operation and maintenance

ABC Collection Certification Exams

The ABC collection certification exams evaluate an operator's knowledge of tasks related to the operation of collection systems. The ABC Collection V&E Committee determined the content of each exam based on the results of the national job analysis. To successfully take an ABC exam, an operator must demonstrate knowledge of the core competencies in this document.

Four levels of certification exams are offered by ABC, with class I being the lowest level and class IV the highest level. The specifications for the exams are based on a weighting of the job analysis results so that they reflect the criticality of tasks performed on the job. The specifications list the percentage of questions on the exam that fall under each job duty. For example, 15% of the questions on the ABC class I exam relate to the job duty "Operate Equipment." For a list of tasks and capabilities associated with each job duty, please refer to the list of core competencies on the previous pages.

ABC Collection Exam Specifications

	Exam Level			
	Class I	Class II	Class III	Class IV
Operate Equipment	15%	15%	15%	15%
Evaluate and Maintain Equipment	10%	15%	15%	15%
Maintain and Restore Collection System	15%	15%	15%	15%
Maintain Lift Stations	10%	10%	10%	10%
Monitor, Evaluate and Adjust Collection System	35%	30%	25%	25%
Perform Security, Safety and Administrative Procedures	15%	15%	20%	20%

Suggested Collection Exam References

The following are approved as reference sources for the ABC collection examinations. Operators should use the latest edition of these reference sources to prepare for the exam.

California State University, Sacramento (CSUS) Foundation, Office of Water Programs

- *Operation of Wastewater Treatment Plants, Volume I and II*
- *Operation and Maintenance of Wastewater Collection Systems, Volume I and II*
- *Manage for Success*

To order, contact: Office of Water Programs
California State University, Sacramento
6000 J Street
Sacramento, CA 95819-6025

Web site: www.owp.csus.edu
Phone: (916) 278-6142
Fax: (916) 278-5959
E-mail: wateroffice@owp.csus.edu

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Suggested Collection Exam References (continued)

Water Environment Federation

- *Operation of Municipal Wastewater Treatment Plants - Manual of Practice No. 11*
- *Existing Sewer Evaluation and Rehabilitation - Manual of Practice FD-6*
- *Wastewater Collection Systems Management - Manual of Practice No. 7*

To order, contact: Water Environment Federation
601 Wythe Street
Alexandria, VA 22314-1994

Web site: www.wef.org
Phone: (800) 666-0206
Fax: (703) 684-2492
E-mail: pubs@wef.org

Alberta Study Manuals

Alberta Class 1 Study Manual (Volumes A & B)
Alberta Class 2 Study Manual

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Regulations

Occupational Health and Safety Act
Ontario Water Resources Act

<http://www.labour.gov.on.ca/english/hs/>
<http://www.e-laws.gov.on.ca/navigation?file=home&lang=en>

Study Guides (Practice Questions)

Water Environment Federation, *WEF/ABC Collection Systems Operator's Guide to Preparing for the Certification Examination* (www.wef.org; complete contact information at top of page)

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