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A large, dynamic splash of clear blue water is shown at the top of the page, with numerous bubbles and droplets trailing behind it as it moves from right to left. The background is a light, clean white.

# ABC

## Association of Boards of Certification ***Wastewater Collection Need-to-Know Criteria***

*A Need-to-Know Guide when preparing for the  
ABC Wastewater Collection Certification Examination.*

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## **Acknowledgement**

The Association would like to thank the members of the 2010-2011 Wastewater Collection Validation and Examination Committee for their effort in conducting the job analysis and developing the ABC *Need-to-Know Criteria* for Wastewater Collection Operators. Committee members included:

- Lonn Rasmussen, Utah (Chair)
- Mike Bell, Ontario
- Steve Desmond, Oregon
- Bradley Fix, Indiana
- Dwight Lancaster, North Carolina
- Darryl Macy, Georgia
- Coby Shurtleff, Colorado
- Bill Weitkemper, Missouri

## **Introduction**

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As part of the development of its certification exams, the Association of Boards of Certification (ABC) conducted a job analysis of collection operators in 2010. As part of this process, ABC conducted a national survey of collection operators. This *Need-to-Know Criteria* was developed from the results of ABC's 2010 collection operator job analysis.

## **How the Need-to-Know Criteria Was Developed**

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### **Review of Task Survey**

The results of the 2010 task analysis survey were provided to the ABC Collection V&E Committee. In the task analysis 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 214 individuals in the collection industry who completed the survey, 31 were class I operators, 46 were class II operators, 34 were class III operators, and 48 were class IV operators.

### **Analysis of Ratings**

The composite criticality ratings and percentage of operators reporting that they performed the tasks were presented to the Collection V&E Committee in January 2011 to begin development of the new *Need-to-Know Criteria*. V&E committee members were given the opportunity to retain tasks which did not meet decision criteria (a criticality value of at least 10.5, and a percent performing value of at least 50%) if a significant rationale could be provided for their importance on the examination. The V&E committee members were also given the opportunity to remove any tasks which met criteria on the survey but were deemed untestable or inappropriate for the collection certification examination. Final examination blueprint weights were calculated by summing the criticality values of all remaining tasks, and dividing the criticality value of each task by the grand total criticality value. Weights of individual tasks were summed for each core competency area to determine the proportion of the collection certification examination devoted to each core competency.

## Core Competencies

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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, & Adjust Collection System
- Perform Security, Safety, & 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.

## About the Association of Boards of Certification

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Established in 1972, the Association of Boards of Certification (ABC) is a non-profit member-driven organization dedicated to protecting public health and the environment by advancing the quality and integrity of environmental certification programs. ABC membership includes almost 100 certifying authorities, representing more than 40 states, nine Canadian provinces as well as several international programs. Existing solely for its members, ABC is the voice for the profession and serves as the conduit for information in an ever-changing industry.

Over 70 certification programs currently test approximately 35,000 operators and laboratory analysts annually through ABC's industry-leading Certification & Testing Services. Over 400,000 water and wastewater operators, laboratory analysts, and backflow prevention assembly testers have taken an ABC exam since the testing program began in 1982.

### ABC Vision

Promote integrity in environmental certification throughout the world.

### ABC Mission

ABC is dedicated to advancing the quality and integrity of environmental certification programs.

### ABC Objectives

- Promote certification as a means of protecting public health, the infrastructure, and the environment.
- Promote uniformity of standards and best practices in certification.
- Serve as the technical resource for certification entities.
- Facilitate the transfer of certification between certifying authorities.
- Serve the needs of our members.

## 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 task analysis survey. 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, 21% of the questions on the ABC class I collection 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 following pages.

### ABC Collection Exam Specifications

Blueprint Area	Class I	Class II	Class III	Class IV
Operate Equipment	21%	20%	19%	20%
Evaluate and Maintain Equipment	25%	25%	25%	24%
Maintain and Restore Collection System	10%	10%	10%	11%
Maintain Lift Stations	14%	14%	14%	13%
Monitor, Evaluate, & Adjust Collection System	9%	10%	11%	10%
Perform Security, Safety, & Administrative Procedures	21%	21%	21%	22%

Operate Equipment	Class I	Class II	Class III	Class IV
Blowers and compressors	Comprehension	Comprehension	Application	Application
Boring equipment	N/A	N/A	Comprehension	Comprehension
Cathodic protection devices	N/A	N/A	Application	Application
Chemical feeders	Comprehension	Comprehension	Comprehension	Application
Cleaning equipment	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
Hand tools	Application	Application	Application	Application
Heavy vehicles	Application	Application	Application	Application

Operate Equipment Continued	Class I	Class II	Class III	Class IV
High velocity cleaners	Application	Application	Analysis	Analysis
Inspection equipment (vacuum testing, pressure testing)	Comprehension	Application	Application	Application
Motors	Application	Application	Application	Application
Power tools	Application	Application	Application	Application
Pumps	Application	Application	Application	Application
Rodding equipment	Application	Application	Application	Application
Safety equipment	Application	Application	Application	Application
Tapping equipment	Application	Application	Application	Application
Valves	Application	Application	Application	Application
Variable speed drives	Application	Application	Application	Application

## Required Capabilities

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### Knowledge of:

- Function of tools
- General chemistry
- General electrical principles
- General mechanical principles
- Hydraulic equipment
- Instrumentation
- Internal combustion engines
- Lubricants and fluids
- Operation and maintenance practices
- Physical science
- Pipe fittings and joining methods
- Pipeline construction principles
- Piping material type and size
- Pneumatics
- Potential causes of disasters in system
- Potential impact of disasters on system
- Regulations
- Safety regulations
- Start-up and shut-down procedures
- System operation and maintenance
- Types of lift stations
- Types of pumps
- Wastewater collection system operation and maintenance
- Wastewater treatment concepts

### Ability to:

- Adjust equipment
- Calibrate equipment
- Discriminate between normal and abnormal conditions
- Evaluate cause of damage
- Evaluate operation of equipment
- Follow written procedures
- Identify cause of damage
- Identify potential safety hazards
- Interpret data
- Interpret Material Safety Data Sheets
- Locate cause of flow problems
- Maintain system in normal operating condition
- Monitor electrical equipment
- Monitor mechanical equipment
- Monitor mechanical equipment
- Operate safety equipment
- Perform impact assessments
- Perform mathematical calculations
- Perform physical measurements
- Read plans and profiles
- Recognize unsafe work conditions
- Record information

Evaluate and Maintain Equipment	Class I	Class II	Class III	Class IV
<b><i>Perform Maintenance on Equipment</i></b>				
Blowers and compressors	Comprehension	Comprehension	Comprehension	N/A
Calibration of chemical feeders	Comprehension	Comprehension	Comprehension	Comprehension
Cleaning equipment	Comprehension	Comprehension	Comprehension	Comprehension
Electrical controls	Comprehension	Comprehension	Comprehension	Comprehension
Engines	Comprehension	Comprehension	Comprehension	Comprehension
Excavating equipment	Comprehension	Comprehension	Comprehension	Comprehension
Flow monitoring equipment	Comprehension	Comprehension	Analysis	Analysis
Generators	Comprehension	Application	Application	Application
Hand tools	Application	Application	Application	Application
Heavy vehicles	Comprehension	Comprehension	Comprehension	Comprehension
High velocity cleaners	Comprehension	Comprehension	Analysis	Analysis
Inspection equipment (tv vacuum testing, pressure testing)	Comprehension	Application	Analysis	Analysis
Motors	Application	Application	Application	Application
Power tools	Application	Application	Application	Application
Pumps	Application	Application	Analysis	Analysis
Rodding equipment	Application	Application	Analysis	Analysis
Safety equipment	Application	Application	Application	Application
Tapping equipment	N/A	N/A	Application	Application
Valves	Comprehension	Comprehension	Comprehension	Comprehension
Variable speed drives	Comprehension	Comprehension	Analysis	Analysis
<b><i>Evaluate Operation of Equipment</i></b>				
Inspect equipment for abnormal conditions	Analysis	Analysis	Analysis	Analysis
Measure temperature of equipment	Comprehension	Comprehension	Analysis	Analysis
Read charts	Comprehension	Comprehension	Analysis	Analysis
Read gauges	Analysis	Analysis	Analysis	Analysis
Read meters	Analysis	Analysis	Analysis	Analysis
Troubleshoot electrical equipment	Analysis	Analysis	Analysis	Analysis

## Required Capabilities

### Knowledge of:

- Function of tools
- General electrical principles
- Instrumentation
- Internal combustion engines
- Lubricants and fluids
- Operation and maintenance practices
- Physical science
- Pneumatics
- Start-up and shut-down procedures
- System operation and maintenance
- Types of lift stations
- Types of pumps
- Wastewater collection system operation and maintenance

### Ability to:

- Adjust equipment
- Calibrate equipment
- Diagnose/troubleshoot
- Differentiate between preventative and corrective maintenance
- Discriminate between normal and abnormal conditions
- Evaluate cause of damage
- Evaluate operation of equipment
- Evaluate system performance
- Follow written procedures
- Identify cause of damage
- Identify potential safety hazards
- Interpret data
- Maintain system in normal operating condition
- Monitor mechanical equipment
- Perform general maintenance
- Perform impact assessments
- Perform physical measurements
- Recognize unsafe work conditions
- Record information

Maintain and Restore Collection System	Class I	Class II	Class III	Class IV
<b>Clean System</b>				
Hydraulic cleaning (balling, flushing, poly pig)	Application	Application	Application	Analysis
Jet rodding	Application	Application	Application	Analysis
Remove stoppage	Application	Application	Analysis	Analysis
Rodding	Application	Application	Application	Analysis
Root control	Application	Application	Analysis	Analysis
<b>Inspect System</b>				
Dye testing	N/A	Application	Application	Application
Physical inspection	Application	Application	Application	Application
Televising	Comprehension	Comprehension	Analysis	Analysis
<b>Rehabilitate and Repair Collection System</b>				
Lift station fitting and piping	Application	Application	Analysis	Analysis
Manholes	Application	Application	Analysis	Analysis

Maintain and Restore Collection System Continued	Class I	Class II	Class III	Class IV
<b>Rehabilitate and Repair Collection System Continued</b>				
Sewer lines	Application	Application	Analysis	Analysis
Taps	Application	Application	Analysis	Analysis

## Required Capabilities

### Knowledge of:

- Function of tools
- General hydraulic principles
- Instrumentation
- Operation and maintenance practices
- Physical science
- Pipe fittings and joining methods
- Pipeline construction principles
- Piping material type and size
- Potential causes of disasters in system
- Potential impact of disasters on system
- Regulations
- Risk management
- Start-up and shut-down procedures
- System operation and maintenance
- Types of lift stations
- Types of pumps
- Wastewater collection design parameters
- Wastewater collection system concepts
- Wastewater collection system operation and maintenance
- Wastewater treatment concepts

### Ability to:

- Adjust equipment
- Diagnose/troubleshoot
- Differentiate between preventative and corrective maintenance
- Discriminate between normal and abnormal conditions
- Evaluate cause of damage
- Evaluate data from inspections
- Evaluate system performance
- Follow written procedures
- Identify cause of damage
- Identify potential safety hazards
- Interpret data
- Interpret Material Safety Data Sheets
- Locate cause of flow problems
- Maintain system in normal operating condition
- Monitor mechanical equipment
- Perform general maintenance
- Perform impact assessments
- Perform physical measurements
- Read plans and profiles
- Recognize unsafe work conditions
- Record information

Maintain Lift Stations	Class I	Class II	Class III	Class IV
<b>Electrical</b>				
Fuses	Application	Application	Analysis	Analysis
Motors	Application	Application	Analysis	Analysis
Relays	Application	Application	Analysis	Analysis
Starters	Application	Application	Analysis	Analysis
<b>Electronic</b>				
Alarms	Application	Application	Analysis	Analysis
Controllers	Application	Application	Analysis	Analysis

Maintain Lift Stations Continued	Class I	Class II	Class III	Class IV
<b>Electronic Continued</b>				
Gas detection	Application	Application	Analysis	Analysis
Level detection system	Application	Application	Analysis	Analysis
RTU (remote transmitting units)	Application	Application	Analysis	Analysis
<b>Mechanical</b>				
Piping	Application	Application	Analysis	Analysis
Pressure relief valves	Application	Application	Analysis	Analysis
Pre-treatment	N/A	N/A	Analysis	Analysis
Pumps	Application	Application	Analysis	Analysis
Valves	Application	Application	Analysis	Analysis
Wet wells	Application	Application	Analysis	Analysis

## Required Capabilities

### Knowledge of:

- Computer operations
- Function of tools
- General electrical principles
- Hazardous situations
- Instrumentation
- Internal combustion engines
- Lubricants and fluids
- Physical science
- Pipe fittings and joining methods
- Pipeline construction principles
- Piping material type and size
- Pneumatics
- Potential causes of disasters in system
- Potential impact of disasters on system
- Start-up and shut-down procedures
- System operation and maintenance
- Types of lift stations
- Types of pumps
- Wastewater collection system operation and maintenance

### Ability to:

- Adjust equipment
- Calibrate equipment
- Diagnose/troubleshoot
- Differentiate between preventative and corrective maintenance
- Discriminate between normal and abnormal conditions
- Evaluate cause of damage
- Evaluate operation of equipment
- Evaluate system performance
- Follow written procedures
- Identify cause of damage
- Identify potential safety hazards
- Interpret data
- Locate cause of flow problems
- Maintain system in normal operating condition
- Monitor electrical equipment
- Monitor mechanical equipment
- Operate safety equipment
- Perform general maintenance
- Perform physical measurements
- Read plans and profiles
- Recognize unsafe work conditions
- Record information

Monitor, Evaluate, & Adjust Collection System	Class I	Class II	Class III	Class IV
Aeration for hydrogen sulfide control	Comprehension	Comprehension	Application	Application
Biological filters for odor control	N/A	Comprehension	Application	Application
Chemical addition for hydrogen sulfide control	Comprehension	Comprehension	Application	Analysis
Cross connections	Comprehension	Comprehension	Comprehension	Comprehension
Flow monitoring	Comprehension	Comprehension	Analysis	Analysis
Force mains	Analysis	Analysis	Analysis	Analysis
Gravity sewers	Analysis	Analysis	Analysis	Analysis
Infiltration (inflow, exfiltration)	Application	Application	Analysis	Analysis
Lift stations	Analysis	Analysis	Analysis	Analysis
Manholes	Analysis	Analysis	Analysis	Analysis
Measuring and control systems	Analysis	Analysis	Analysis	Analysis
Pressure sewers (S.T.E.P.)	N/A	N/A	N/A	Analysis
Vacuum sewers	N/A	Analysis	Analysis	Analysis

## Required Capabilities

### Knowledge of:

- Adjust equipment
- Assess likelihood of disaster occurring
- Calibrate equipment
- Communicate in writing
- Communicate verbally
- Conduct meetings
- Conduct training programs
- Coordinate emergency response with other organizations
- Demonstrate safe work habits
- Diagnose/troubleshoot
- Differentiate between preventative and corrective maintenance
- Discriminate between normal and abnormal conditions
- Evaluate data from inspections
- Evaluate operation of equipment
- Evaluate proposals
- Evaluate system performance

### Ability to:

- Adjust equipment
- Calibrate equipment
- Diagnose/troubleshoot
- Differentiate between preventative and corrective maintenance
- Discriminate between normal and abnormal conditions
- Evaluate cause of damage
- Evaluate data from inspections
- Evaluate operation of equipment
- Evaluate system performance
- Follow written procedures
- Identify cause of damage
- Identify potential safety hazards
- Interpret data
- Interpret Material Safety Data Sheets
- Locate cause of flow problems
- Maintain system in normal operating condition
- Monitor electrical equipment
- Monitor mechanical equipment

## Required Capabilities Continued

### Knowledge of:

- Follow written procedures
- Generate written safety procedures
- Identify cause of damage
- Identify potential safety hazards
- Interpret data
- Interpret Material Safety Data Sheets
- Locate cause of flow problems
- Maintain system in normal operating condition
- Monitor mechanical equipment
- Negotiate contracts
- Operate safety equipment
- Order necessary spare parts
- Perform general maintenance
- Perform impact assessments

### Ability to:

- Operate safety equipment
- Perform general maintenance
- Perform impact assessments
- Perform mathematical calculations
- Perform physical measurements
- Read plans and profiles
- Recognize unsafe work conditions
- Recognize unsafe work conditions
- Record information

Perform Security, Safety, & Administrative Procedures	Class I	Class II	Class III	Class IV
<b>Administer System</b>				
Administer safety compliance program	Application	Application	Analysis	Analysis
Develop budget	N/A	N/A	Analysis	Analysis
Develop capital improvement plan	N/A	N/A	N/A	Analysis
Develop operation and maintenance plan	Application	Application	Analysis	Analysis
Evaluate employee performance	Application	Application	Application	Analysis
Hire employees	N/A	N/A	Application	Analysis
Maintain records	Application	Application	Analysis	Analysis
Perform workplace safety evaluations	Application	Application	Analysis	Analysis
Plan and organize work activities	Application	Application	Analysis	Analysis
Record and evaluate data	Application	Application	Analysis	Analysis
Respond to public complaints	Application	Application	Analysis	Analysis
Supervise employee work activities	Application	Application	Application	Analysis
Write reports (federal, internal, state)	Application	Application	Analysis	Analysis

<b>Perform Security, Safety, &amp; Administrative Procedures Continued</b>	<b>Class I</b>	<b>Class II</b>	<b>Class III</b>	<b>Class IV</b>
<b><i>Safety Procedures</i></b>				
<b>Calibration of atmospheric testing devices</b>	Analysis	Analysis	Analysis	Analysis
<b>Chemical spill</b>	Analysis	Analysis	Analysis	Analysis
<b>Confined space entry</b>	Analysis	Analysis	Analysis	Analysis
<b>Electrical hazards</b>	Analysis	Analysis	Analysis	Analysis
<b>Fires</b>	Analysis	Analysis	Analysis	Analysis
<b>First aid</b>	Analysis	Analysis	Analysis	Analysis
<b>Hazardous material</b>	Analysis	Analysis	Analysis	Analysis
<b>Infectious disease</b>	Analysis	Analysis	Analysis	Analysis
<b>Lifting</b>	Analysis	Analysis	Analysis	Analysis
<b>Lockout/tagout</b>	Analysis	Analysis	Analysis	Analysis
<b>Personal protection equipment</b>	Analysis	Analysis	Analysis	Analysis
<b>Respiratory protection</b>	Analysis	Analysis	Analysis	Analysis
<b>Shoring</b>	Analysis	Analysis	Analysis	Analysis
<b>Traffic control</b>	Analysis	Analysis	Analysis	Analysis
<b>Trenching and excavation</b>	Analysis	Analysis	Analysis	Analysis
<b><i>Emergency Plans</i></b>				
<b>Combined sewer overflows</b>	Application	Application	Analysis	Analysis
<b>Disasters</b>	Application	Application	Analysis	Analysis
<b>Manhole hazards</b>	Application	Application	Analysis	Analysis
<b>Sanitary sewer overflow</b>	Application	Application	Analysis	Analysis
<b>System failure</b>	Application	Application	Analysis	Analysis

## Required Capabilities

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### Knowledge of:

- Emergency plans
- Function of recordkeeping system
- General electrical principles
- General hydraulic principles
- Hazardous situations
- Hydrogen sulfide generation
- Methane generation
- Monitoring and reporting requirements
- Pipe fittings and joining methods
- Pipeline construction principles
- Piping material type and size
- Pneumatics
- Potential causes of disasters in system
- Potential impact of disasters on system
- Regulations
- Risk management
- Safety regulations
- Start-up and shut-down procedures
- System operation and maintenance
- Types of lift stations
- Types of pumps
- Wastewater collection design parameters
- Wastewater collection system concepts
- Wastewater collection system operation and maintenance
- Wastewater treatment concepts

### Ability to:

- Adjust equipment
- Assess likelihood of disaster occurring
- Calibrate equipment
- Communicate in writing
- Communicate verbally
- Conduct meetings
- Conduct training programs
- Coordinate emergency response with other organizations
- Demonstrate safe work habits
- Diagnose/troubleshoot
- Differentiate between preventative and corrective maintenance
- Discriminate between normal and abnormal conditions
- Evaluate cause of damage
- Evaluate data from inspections
- Evaluate operation of equipment
- Evaluate proposals
- Evaluate system performance
- Follow written procedures
- Generate written safety procedures
- Identify cause of damage
- Identify potential safety hazards
- Interpret data
- Interpret Material Safety Data Sheets
- Locate cause of flow problems
- Maintain system in normal operating condition
- Monitor mechanical equipment
- Negotiate contracts
- Operate safety equipment
- Order necessary spare parts
- Perform general maintenance
- Perform impact assessments
- Perform mathematical calculations
- Perform physical measurements
- Prepare proposals
- Read plans and profiles
- Recognize unsafe work conditions
- Record information
- Review reports
- Select safety equipment
- Transcribe data
- Translate technical language into common terminology
- Write policies and procedures

## References

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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:**

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E-mail: [wateroffice@owp.csus.edu](mailto:wateroffice@owp.csus.edu)

### 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*

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