ABC Testing
A WPI SERVICE

NEED-TO-KNOW CRITERIA

Plant Maintenance Technologist

A Need-to-Know Guide when preparing for the:

ABC Plant Maintenance Technologist Certification Exam

WPI WATER PROFESSIONALS INTERNATIONAL
The Associated Boards of Certification

Superior Water Starts Here™

Before You Dive In…

What is the *Need-to-Know Criteria*?

This **ABC Plant Maintenance Technologist** Need-to-Know Criteria was developed to assist technologists in understanding the content that will be covered in the ABC Plant Maintenance Technologist exam. A methodical and comprehensive international investigation was conducted to determine the most significant job tasks performed by technologists. The content covered in the exam represents the job tasks identified through this research as essential operator competencies and is not limited to the practices of your site. The following pages organize these job tasks into Core Competency Job Areas and identify the amount of the test devoted to each area.

Is this *Need-to-Know Criteria* relevant to MY exam?

WPI offers a variety of standardized and customized exam services. This document is reflective only of the ABC Plant Maintenance Technologist exam; older editions of the standardized exam and various customized exams are also administered by various certification programs. Please contact your certifying authority to determine whether they have implemented this exam for your program.

Exam Preparation Resources

Visit **gowpi.org** to access the formula/conversion table administered with this exam, a list of approved references, information on purchasing study guides available from partner organizations, and more.

Copyright Notice

All examination questions are the copyrighted property of WPI. It is forbidden under federal copyright law to copy, reproduce, record, distribute, or display these examination questions by any means, in whole or in part, without written permission from WPI. Doing so may subject violators to severe civil and criminal penalties.

ABC Plant Maintenance Technologist

Introduction

As part of the development of a water and wastewater treatment plant maintenance technologist certification program, Water Professionals International (WPI) conducted a national job analysis of maintenance technologists in 2007. The purpose of the job analysis was to identify the essential job tasks performed by technologists and the capabilities required to competently perform these job tasks. The results of this job analysis provided WPI with the foundation for the development of valid maintenance technologist certification exams.

This *Need-to-Know Criteria* was developed from the results of WPI's national maintenance technologist job analysis. The information in this document reflects the essential job tasks performed by technologists and their requisite capabilities. This document is intended to be used by certification programs and trainers to help prepare technologists for certification.

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

Task Survey

WPI's Plant Maintenance Task Force provided technical assistance throughout the job analysis process. This task force worked with WPI staff to develop the national job task survey, in which 525 maintenance technologists throughout the United States and Canada signed up to participate. A total of 310 surveys were completed for a response rate of 59%.

In this survey, technologists were asked to rate job tasks and capabilities on rating scales 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. The task survey also included a background information section where demographic data such as gender, age, ethnic origin, educational level attained, and work experience were collected. Space was provided at the end of the survey for technologists to list any important tasks performed on their job that were not included on the survey and to make general comments.

Results

Survey respondents were divided into class levels based on survey responses. The class levels are as follows:

Class I: Lubricate, perform readings, conduct rounds, perform routine preventive maintenance

Class II: Tear down, perform repairs, install and reinstall (plus tasks listed above)

Class III: Inspect and manage duties listed above, analyze and perform predictive maintenance (plus tasks listed above)

Class IV: Recommend purchases, develop schedules and budgets (plus tasks listed above)

The mean seriousness and frequency ratings and the percentage of respondents performing each task statement at each class level were computed. The mean ratings were used to determine the importance of items. The percentage of respondents performing each task statement was used to identify tasks and capabilities commonly performed by technologists throughout the United States and Canada.

A criticality value of 2 (mean seriousness rating) + mean frequency rating was calculated for each item on the survey. This formula gives extra weight to the seriousness rating in determining critical items and was appropriate because it emphasized the purpose of certification—to provide competent maintenance technologists.

CORE COMPETENCY JOB AREAS

The WPI Plant Maintenance Task Force reviewed the results of the task survey to identify the most important and commonly performed job tasks and capabilities for maintenance technologists. Tasks and their requisite capabilities performed by at least 50% of the respondents and with a high criticality value were designated as core competencies.

The core competencies are considered the essential tasks and capabilities for maintenance technologists and are clustered into the following job duties:

- **Operation and Maintenance**
- **Electrical and Instrumentation**
- **Math**
- **Safety and Administration**

Four levels of certification are offered by WPI, with Class I being the lowest level and Class IV the highest level. The following pages list the core competencies for each class level of maintenance technologist.

Plant Maintenance Technologist Certification Exams

The WPI plant maintenance exams evaluate a technologist's knowledge of tasks required to be certified. The WPI Plant Maintenance Task Force determined the content of each exam based on the results of the national job analysis. To pass a WPI exam, a technologist must demonstrate knowledge of these core competencies.

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, 70% of the class I exam consists of questions relating to the job duty Operation and Maintenance. Within this job duty, 25% to 30% of the questions are on Equipment Operations, 35% to 40% on Preventive Maintenance, 5% to 10% on Corrective Maintenance, and 0% to 5% on Predictive Maintenance. For a list of tasks and capabilities associated with each job duty, please refer to the list of core competencies in the following pages.

EXAM SPECIFICATIONS

CORE COMPETENCY JOB AREA	CLASS I	CLASS II	CLASS III	CLASS IV
OPERATION AND MAINTENANCE:	70%	65%	58%	45%
EQUIPMENT OPERATIONS	25%-30%	10%-15%	TBD	TBD
PREVENTIVE MAINTENANCE	35%-40%	20%-25%	TBD	TBD
CORRECTIVE MAINTENANCE	5%-10%	25%-30%	TBD	TBD
PREDICTIVE MAINTENANCE	0-5%	5%-10%	TBD	TBD
ELECTRICAL AND INSTRUMENTATION	5%	7%	10%	15%
MATH	10%	13%	12%	15%
SAFETY AND ADMINISTRATION	15%	15%	20%	25%

OPERATION AND MAINTENANCE

Equipment	Class I	Class II	Class III	Class IV
Boilers	**Inspect**	**Inspect**	**Inspect**	**Maintain**
Compressors/blowers	**Inspect**	**Maintain**	**Replace**	**Replace**
Engines	**Inspect**	**Maintain**	**Replace**	**Replace**
Heavy equipment	**Inspect**	**Maintain**	**Maintain**	**Maintain**
Motors	**Inspect**	**Replace**	**Replace**	**Replace**
Pumps (centrifugal and positive displacement)	**Inspect**	**Replace**	**Replace**	**Replace**
Valves	**Inspect**	**Replace**	**Replace**	**Replace**

The following types of compressors/blowers may be covered on the Class I exam: centrifugal, fan. Class II - IV exams may cover: centrifugal, fan, reciprocating piston positive displacement, rotary lobe positive displacement.

The following types of engines may be covered on Class I - IV exams: diesel, emergency generators, gas, natural gas, small (mower), vehicle/machinery.

The following types of motors may be covered on Class I - IV exams: single phase, synchronous, three-phase.

The following types of centrifugal pumps may be covered on Class I - IV exams: end suction, split case, line shaft (vertical), submersible, turbine.

The following types of positive displacement pumps may be covered on Class I - IV exams: progressing cavity, peristaltic, diaphragm, screw, gear, piston plunge.

The following types of valves may be covered on Class I - IV exams: ball, butterfly, check, corporation stop, diaphragm, float, gate, globe, knife, needle, pilot, pinch, plug, pressure relief, shear, sleeve, slide, sluice gate, solenoid.

OPERATION AND MAINTENANCE

Knowledge of Boilers	Class I	Class II	Class III	Class IV
Air release valve	Inspect	Inspect	Inspect	Maintain
Chemical feed	Inspect	Maintain	Replace	Replace
Corrosion control	Inspect	Maintain	Replace	Replace
Low water cutoff	Inspect	Maintain	Maintain	Maintain
Pressure relief valve	Inspect	Replace	Replace	Replace
Water chemical analysis	Inspect	Replace	Replace	Replace
Knowledge of Compressors/Blowers	**Class I**	**Class II**	**Class III**	**Class IV**
Air dryers	Required	Required	Required	Required
Constant speed control systems	Required	Required	Required	Required
Filters	Required	Required	Required	Required
Mufflers	Required	Required	Required	Required
On-off control systems	Required	Required	Required	Required
Pressure relief	Required	Required	Required	Required
Unloader control systems	Required	Required	Required	Required
Knowledge of Heavy Equipment	**Class I**	**Class II**	**Class III**	**Class IV**
Commercial driver license (CDL)	Required	Required	Required	Required
Equipment operator certification	Required	Required	Required	Required
Safety procedures	Required	Required	Required	Required
Knowledge of Motors	**Class I**	**Class II**	**Class III**	**Class IV**
Brake horsepower		Required	Required	Required
Capacitors		Required	Required	Required
Enclosures		Required	Required	Required
Hollow shaft		Required	Required	Required
Motor brushes		Required	Required	Required
Motor efficiency		Required	Required	Required
Motor windings		Required	Required	Required
Mounting		Required	Required	Required
Rotation		Required	Required	Required
Service factor		Required	Required	Required
Knowledge of Pump Operations	**Class I**	**Class II**	**Class III**	**Class IV**
Air binding	Required	Required	Required	Required
Cavitation	Required	Required	Required	Required
Operating against a closed valve	Required	Required	Required	Required
Pump curve	Required	Required	Required	Required
Pump efficiency	Required	Required	Required	Required
Pump head/hydraulics	Required	Required	Required	Required
Reverse rotation	Required	Required	Required	Required
Water hammer (surge)	Required	Required	Required	Required
Knowledge of Pump Components	**Class I**	**Class II**	**Class III**	**Class IV**
Impeller	Required	Required	Required	Required
Lantern ring	Required	Required	Required	Required
Mechanical seals	Required	Required	Required	Required
Packing	Required	Required	Required	Required

OPERATION AND MAINTENANCE

Packing gland	Required	Required	Required	Required
Shaft sleeve	Required	Required	Required	Required
Slinger ring	Required	Required	Required	Required
Stuffing box	Required	Required	Required	Required
Suction/discharge valves	Required	Required	Required	Required
Volute	Required	Required	Required	Required
Wear plate	Required	Required	Required	Required
Wear rings	Required	Required	Required	Required
Knowledge of Valve Application	Class I	Class II	Class III	Class IV
Actuators	Required	Required	Required	Required
Air release	Required	Required	Required	Required
Air vacuum	Required	Required	Required	Required
Backflow prevention	Required	Required	Required	Required
Isolation	Required	Required	Required	Required
Level control	Required	Required	Required	Required
Pressure control	Required	Required	Required	Required
Throttling	Required	Required	Required	Required
Bearings	Class I	Class II	Class III	Class IV
Ball	Required	Required	Required	Required
Needle	Required	Required	Required	Required
Radial	Required	Required	Required	Required
Roller	Required	Required	Required	Required
Spherical	Required	Required	Required	Required
Tapered	Required	Required	Required	Required
Thrust	Required	Required	Required	Required
Bushings	Class I	Class II	Class III	Class IV
Babbitt	Required	Required	Required	Required
Sleeve	Required	Required	Required	Required
Knowledge of Bearings and Bushings	Class I	Class II	Class III	Class IV
Cleaning procedures	Required	Required	Required	Required
Dismounting procedures	Required	Required	Required	Required
Lubrication methods	Required	Required	Required	Required
Mounting procedures	Required	Required	Required	Required
Seals	Required	Required	Required	Required
Shields	Required	Required	Required	Required
Wear pattern analysis	Required	Required	Required	Required
Drive Equipment	Class I	Class II	Class III	Class IV
Actuators	Inspect	Maintain	Replace	Replace
Belts	Inspect	Maintain	Replace	Replace
Brakes	Inspect	Maintain	Replace	Replace
Chains	Inspect	Maintain	Replace	Replace
Clutches	Inspect	Maintain	Replace	Replace
Drive coupling	Inspect	Maintain	Replace	Replace

OPERATION AND MAINTENANCE

Drive shafts	Inspect	Maintain	Replace	Replace
Gearbox	Inspect	Maintain	Replace	Replace
Gears	Inspect	Maintain	Replace	Replace
Universal joints	Inspect	Maintain	Replace	Replace
Variable speed belt drive	Inspect	Maintain	Replace	Replace
Knowledge of Drive Equipment	Class I	Class II	Class III	Class IV
Alignment	Required	Required	Required	Required
Anti-reverse ratchets	Required	Required	Required	Required
Carrier bearings	Required	Required	Required	Required
Gear lash	Required	Required	Required	Required
Gear ratios	Required	Required	Required	Required
Guards	Required	Required	Required	Required
Harmonic imbalance	Required	Required	Required	Required
Lock nuts	Required	Required	Required	Required
Shear pin	Required	Required	Required	Required
Torque overload	Required	Required	Required	Required
Shafts	Class I	Class II	Class III	Class IV
Shafts	Inspect	Maintain	Replace	Replace
Knowledge of Shafts	Class I	Class II	Class III	Class IV
Axial alignment	Required	Required	Required	Required
Bearing fit	Required	Required	Required	Required
Coupling techniques	Required	Required	Required	Required
Dismounting procedures	Required	Required	Required	Required
Endplay	Required	Required	Required	Required
Lubrication methods	Required	Required	Required	Required
Mounting procedures	Required	Required	Required	Required
Out-of-roundness	Required	Required	Required	Required
Plumb	Required	Required	Required	Required
Runout	Required	Required	Required	Required
Storage	Required	Required	Required	Required
Vibration analysis	Required	Required	Required	Required
Wear pattern	Required	Required	Required	Required
Wear sleeves	Required	Required	Required	Required
Material Selection	Class I	Class II	Class III	Class IV
Adhesives	Required	Required	Required	Required
Anti-seize compounds	Required	Required	Required	Required
Coatings/paints	Required	Required	Required	Required
Epoxy	Required	Required	Required	Required
Fastening devices	Required	Required	Required	Required
Gaskets	Required	Required	Required	Required
Locking compounds	Required	Required	Required	Required
Metals	Required	Required	Required	Required

OPERATION AND MAINTENANCE

O-rings	Required	Required	Required	Required
Plastics	Required	Required	Required	Required
Sealants	Required	Required	Required	Required
Shims	Required	Required	Required	Required
Solvents	Required	Required	Required	Required
Knowledge of Materials	**Class I**	**Class II**	**Class III**	**Class IV**
Application procedures	Required	Required	Required	Required
Corrosion control	Required	Required	Required	Required
Material compatibility	Required	Required	Required	Required
Safety Data Sheets	Required	Required	Required	Required
Storage procedures	Required	Required	Required	Required
Tanks	**Class I**	**Class II**	**Class III**	**Class IV**
Tanks	Inspect	Maintain	Maintain	Maintain
Knowledge of Tanks	**Class I**	**Class II**	**Class III**	**Class IV**
Application	Required	Required	Required	Required
Cathodic protection	Required	Required	Required	Required
Coatings	Required	Required	Required	Required
Materials	Required	Required	Required	Required
Overflow/drain lines	Required	Required	Required	Required
Tank access	Required	Required	Required	Required
Ventilation	Required	Required	Required	Required
Wash-down procedures	Required	Required	Required	Required
Use Tools	**Class I**	**Class II**	**Class III**	**Class IV**
Calibration equipment	Required	Required	Required	Required
Electrical instruments	Required	Required	Required	Required
Hand tools	Required	Required	Required	Required
Hoists/cranes	Required	Required	Required	Required
Ladders	Required	Required	Required	Required
Machining equipment	Required	Required	Required	Required
Power tools	Required	Required	Required	Required
Pressure/hot water washer	Required	Required	Required	Required
Rigging	Required	Required	Required	Required
Scaffolds	Required	Required	Required	Required
Sandblasters	Required	Required	Required	Required
Solvent tanks	Required	Required	Required	Required
Welding/cutting equipment	Required	Required	Required	Required
Precision Tools	**Class I**	**Class II**	**Class III**	**Class IV**
Alignment	Required	Required	Required	Required
Caliper	Required	Required	Required	Required
Dial indicator	Required	Required	Required	Required
Laser	Required	Required	Required	Required
Micrometer	Required	Required	Required	Required

OPERATION AND MAINTENANCE

Knowledge of Tools	Class I	Class II	Class III	Class IV
Accuracy	Required	Required	Required	Required
Non-sparking	Required	Required	Required	Required
Precision	Required	Required	Required	Required
Sharpening	Required	Required	Required	Required
Tool storage	Required	Required	Required	Required
Knowledge of Ancillary Crafts	**Class I**	**Class II**	**Class III**	**Class IV**
Backflow prevention	Required	Required	Required	Required
Computers	Required	Required	Required	Required
Herbicides and pesticides			Required	Required
Welding	Required	Required	Required	Required
Piping	**Class I**	**Class II**	**Class III**	**Class IV**
Flare		Required	Required	Required
Grout		Required	Required	Required
Identify line location		Required	Required	Required
Install pipe hangers		Required	Required	Required
Install vibration couplings		Required	Required	Required
Install/lay		Required	Required	Required
Leak detection		Required	Required	Required
Repair		Required	Required	Required
Tap		Required	Required	Required
Thaw		Required	Required	Required
Thread		Required	Required	Required
Weld/join		Required	Required	Required
Wrap	Required	Required	Required	Required
Knowledge of Piping	**Class I**	**Class II**	**Class III**	**Class IV**
Assembly procedures		Required	Required	Required
Backfill procedures		Required	Required	Required
Cathodic protection		Required	Required	Required
C-factor		Required	Required	Required
Clamps		Required	Required	Required
Couplings and fittings		Required	Required	Required
Clamps		Required	Required	Required
Couplings and fittings		Required	Required	Required
Excavation techniques		Required	Required	Required
Flanges		Required	Required	Required
Hydraulic concepts	Required	Required	Required	Required
Material application		Required	Required	Required
Material compatibility		Required	Required	Required
Material transport		Required	Required	Required
Storage of pipes		Required	Required	Required
Tapping sleeves/saddles		Required	Required	Required
Thrust		Required	Required	Required
Types of material		Required	Required	Required

OPERATION AND MAINTENANCE

Use Lubricants	Class I	Class II	Class III	Class IV
Grease	Required	Required	Required	Required
Oil	Required	Required	Required	Required
Water	Required	Required	Required	Required
Knowledge of Lubrication	Class I	Class II	Class III	Class IV
Additives		Required	Required	Required
Analysis		Required	Required	Required
Application method		Required	Required	Required
Cooling systems		Required	Required	Required
Disposal systems		Required	Required	Required
Environment		Required	Required	Required
Failure analysis		Required	Required	Required
Filter systems		Required	Required	Required
Food-grade lubricants	Required	Required	Required	Required
Grades of lubricants	Required	Required	Required	Required
Load	Required	Required	Required	Required
Lubrication survey		Required	Required	Required
Lubrication systems	Required	Required	Required	Required
Manufacturer requirements	Required	Required	Required	Required
Petroleum-based lubricants	Required	Required	Required	Required
Product compatibility	Required	Required	Required	Required
Sampling	Required	Required	Required	Required
Scheduling	Required	Required	Required	Required
Synthetic lubricants	Required	Required	Required	Required
Temperature	Required	Required	Required	Required
Predictive Maintenance	Class I	Class II	Class III	Class IV
Amperage		Required	Required	Required
Efficiency testing			Required	Required
Flow monitoring	Required	Required	Required	Required
Hour readings	Required	Required	Required	Required
Megohm meter readings			Required	Required
Oil analysis	Required	Required	Required	Required
Pressure recording	Required	Required	Required	Required
Temperature monitoring	Required	Required	Required	Required
Thermography			Required	Required
Ultrasonics			Required	Required
Vibration analysis	Required	Required	Required	Required

ELECTRICAL & INSTRUMENTATION

Electrical Devices	Class I	Class II	Class III	Class IV
Capacitors			Maintain	Maintain
Circuit breakers			Maintain	Maintain
Fuses			Maintain	Maintain
Heaters/overload protection			Maintain	Maintain
Knife switches			Maintain	Maintain
Relays			Maintain	Maintain
Soft start (reduced voltage starter)		Identify	Identify	Identify
Switch gears			Maintain	Maintain
Transformers			Maintain	Maintain
Variable frequency drives		Identify	Identify	Identify
Wound-rotors			Maintain	Maintain
Knowledge of Electrical Devices	**Class I**	**Class II**	**Class III**	**Class IV**
Ammeter	Required	Required	Required	Required
Conduit	Required	Required	Required	Required
Ground fault circuit interrupters (GFCI)	Required	Required	Required	Required
Internal motor-heating coils	Required	Required	Required	Required
Leak detection (insulation)	Required	Required	Required	Required
Magnetic starters	Required	Required	Required	Required
Motor control	Required	Required	Required	Required
Phase protection monitoring	Required	Required	Required	Required
Vibration monitoring	Required	Required	Required	Required
Voltmeter	Required	Required	Required	Required
Watt-hour meter	Required	Required	Required	Required
Knowledge of Electrical Concepts	**Class I**	**Class II**	**Class III**	**Class IV**
Amperage	Required	Required	Required	Required
Grounding	Required	Required	Required	Required
Load demand	Required	Required	Required	Required
Resistance	Required	Required	Required	Required
Voltage	Required	Required	Required	Required
Wattage	Required	Required	Required	Required
Wire sizing	Required	Required	Required	Required
Instrumentation Control	**Class I**	**Class II**	**Class III**	**Class IV**
Electronic equipment		Maintain	Calibrate	Install
Instrumentation		Maintain	Calibrate	Install
Level/flow devices		Maintain	Calibrate	Install
Instruments	**Class I**	**Class II**	**Class III**	**Class IV**
Air velocity	Identify	Identify	Maintain/Replace	Maintain/Replace
Chart recorder	Identify	Identify	Maintain/Replace	Maintain/Replace
Chlorine	Identify	Identify	Maintain/Replace	Maintain/Replace
Conductivity	Identify	Identify	Maintain/Replace	Maintain/Replace
Dissolved oxygen (DO)	Identify	Identify	Maintain/Replace	Maintain/Replace
Gas monitors	Identify	Identify	Maintain/Replace	Maintain/Replace
Oxidation reduction potential (ORP)	Identify	Identify	Maintain/Replace	Maintain/Replace

ELECTRICAL & INSTRUMENTATION

Particle counters	Identify	Identify	Maintain/Replace	Maintain/Replace
pH	Identify	Identify	Maintain/Replace	Maintain/Replace
Power supply	Identify	Identify	Maintain/Replace	Maintain/Replace
Recorders	Identify	Identify	Maintain/Replace	Maintain/Replace
Streaming current	Identify	Identify	Maintain/Replace	Maintain/Replace
Temperature	Identify	Identify	Maintain/Replace	Maintain/Replace
Totalizer	Identify	Identify	Maintain/Replace	Maintain/Replace
Electronic Equipment	**Class I**	**Class II**	**Class III**	**Class IV**
Autodialers	Identify	Identify	Identify	Identify
On/off control	Identify	Identify	Identify	Identify
Programmable logic controllers (PLC)	Identify	Identify	Identify	Identify
Radio/SCADA systems	Identify	Identify	Identify	Identify
Knowledge of Instrumentation and Electronic Equipment	**Class I**	**Class II**	**Class III**	**Class IV**
Alarm set-points	Required	Required	Required	Required
Analog	Required	Required	Required	Required
Diaphragms	Required	Required	Required	Required
Digital	Required	Required	Required	Required
Oil fill	Required	Required	Required	Required
Programming	Required	Required	Required	Required
Troubleshooting techniques	Required	Required	Required	Required
Level/Flow Devices	**Class I**	**Class II**	**Class III**	**Class IV**
Bubblers	Identify	Maintain/Replace	Maintain/Replace	Maintain/Replace
Conductivity	Identify	Maintain/Replace	Maintain/Replace	Maintain/Replace
Doppler	Identify	Maintain/Replace	Maintain/Replace	Maintain/Replace
Electrode	Identify	Maintain/Replace	Maintain/Replace	Maintain/Replace
Float	Identify	Maintain/Replace	Maintain/Replace	Maintain/Replace
Magnetic	Identify	Maintain/Replace	Maintain/Replace	Maintain/Replace
Manometer	Identify	Maintain/Replace	Maintain/Replace	Maintain/Replace
Palmer-Bowlus flume	Identify	Maintain/Replace	Maintain/Replace	Maintain/Replace
Parshall flume	Identify	Maintain/Replace	Maintain/Replace	Maintain/Replace
Pressure differential (venturi)	Identify	Maintain/Replace	Maintain/Replace	Maintain/Replace
Pressure transducers	Identify	Maintain/Replace	Maintain/Replace	Maintain/Replace
Propeller	Identify	Maintain/Replace	Maintain/Replace	Maintain/Replace
Ultrasonic	Identify	Maintain/Replace	Maintain/Replace	Maintain/Replace
V-notch weir	Identify	Maintain/Replace	Maintain/Replace	Maintain/Replace
Other closed pipe	Identify	Maintain/Replace	Maintain/Replace	Maintain/Replace
Other open-channel	Required	Maintain/Replace	Maintain/Replace	Maintain/Replace
Knowledge of Level/Flow Devices	**Class I**	**Class II**	**Class III**	**Class IV**
Application procedures	Required	Required	Required	Required
Methods of measuring drawdown	Required	Required	Required	Required
Troubleshooting techniques	Required	Required	Required	Required

MATH

Perform calculations	Class I	Class II	Class III	Class IV
Addition and subtraction	Required	Required	Required	Required
Division and multiplication	Required	Required	Required	Required
Basic algebra	Required	Required	Required	Required
Basic geometry	Required	Required	Required	Required
Exponents	Required	Required	Required	Required
Graphing	Required	Required	Required	Required

SAFETY AND ADMINISTRATION

Follow Safety Procedures	Class I	Class II	Class III	Class IV
Chemical handling	Required	Required	Required	Required
Confined space entry	Required	Required	Required	Required
Cross-connection control	Required	Required	Required	Required
Electrical hazards	Required	Required	Required	Required
Explosion-proof lighting	Required	Required	Required	Required
Extension cords	Required	Required	Required	Required
Fire safety	Required	Required	Required	Required
Laboratory safety	Required	Required	Required	Required
Lock-out/tag-out	Required	Required	Required	Required
Traffic control/work zone safety	Required	Required	Required	Required
Trenching and shoring	Required	Required	Required	Required
Knowledge of Safety Procedures	**Class I**	**Class II**	**Class III**	**Class IV**
Amperage	Required	Required	Required	Required
Arc Flash	Required	Required	Required	Required
Certification requirements	Required	Required	Required	Required
Combustible gas devices	Required	Required	Required	Required
Emergency response plans	Required	Required	Required	Required
Fall/retrieval equipment	Required	Required	Required	Required
Fuel tanks/cans	Required	Required	Required	Required
Grounding	Required	Required	Required	Required
Job safety analysis	Required	Required	Required	Required
Lightning protection	Required	Required	Required	Required
Safety Data Sheets	Required	Required	Required	Required
Knowledge of Personal Protective Equipment	Required	Required	Required	Required
Rescue procedures	Required	Required	Required	Required
Resistance	Required	Required	Required	Required
Right to Know Law	Required	Required	Required	Required
Ventilation	Required	Required	Required	Required
Voltage	Required	Required	Required	Required
Wattage	Required	Required	Required	Required
Wire sizing	Required	Required	Required	Required
Working over water	Required	Required	Required	Required
Administrative/Maintenance Management	**Class I**	**Class II**	**Class III**	**Class IV**
Asset management				Required
Budgeting				Required
Corrective maintenance		Required	Required	Required
Cost accounting				Required
Employee training		Required	Required	Required
Energy management				Required
Inventory control				Required
Plan scheduling (prioritizing)			Required	Required
Predictive maintenance	Required	Required	Required	Required
Preventive maintenance	Required	Required	Required	Required

SAFETY AND ADMINISTRATION

Record keeping	Required	Required	Required	Required
Work order	Required	Required	Required	Required
Report writing		Required	Required	Required
Knowledge of Administration/Maintenance Management	**Class I**	**Class II**	**Class III**	**Class IV**
Computer maintenance management systems	Required	Required	Required	Required
Reporting requirements	Required	Required	Required	Required
Spreadsheet software	Required	Required	Required	Required
Word processing software	Required	Required	Required	Required
System Security	**Class I**	**Class II**	**Class III**	**Class IV**
Fences, lighting, and locks	Maintain	Maintain	Maintain	Maintain
Chemical delivery	Maintain	Maintain	Maintain	Maintain
Surveillance	Maintain	Maintain	Maintain	Maintain
Data security	Protect	Protect	Protect	Protect
Vehicle security	Protect	Protect	Protect	Protect
Computer access	Restrict	Restrict	Restrict	Required
System access	Restrict	Restrict	Restrict	Required
Vulnerability assessments			Perform/Update	Perform/Update
Knowledge of System Security	**Class I**	**Class II**	**Class III**	**Class IV**
Communication systems	Required	Required	Required	Required
Homeland security	Required	Required	Required	Required
Security awareness	Required	Required	Required	Required
Drawings	**Class I**	**Class II**	**Class III**	**Class IV**
As-built drawings/blueprints		Interpret	Interpret	Interpret
Charts		Interpret	Interpret	Interpret
Electrical line diagrams		Interpret	Interpret	Interpret
Ladder logic diagrams			Interpret	Interpret
Operation and maintenance manuals	Interpret	Interpret	Interpret	Interpret
Process and instrumentation diagrams		Interpret	Interpret	Interpret
Schematics		Interpret	Interpret	Interpret
Standard operating procedures (SOPs)	Interpret	Interpret	Interpret	Interpret
System maps	Interpret	Interpret	Interpret	Interpret
Knowledge of Drawings	**Class I**	**Class II**	**Class III**	**Class IV**
Geographic information system (GIS)	Required	Required	Required	Required
Graphing	Required	Required	Required	Required
Sketching techniques	Required	Required	Required	Required
Regulations and Standards	**Class I**	**Class II**	**Class III**	**Class IV**
Comply with requirements	Required	Required	Required	Required
Implement requirements	Required	Required	Required	Required
Record requirements	Required	Required	Required	Required
Report requirements	Required	Required	Required	Required

SAFETY AND ADMINISTRATION

Knowledge of Regulations/Standards	Class I	Class II	Class III	Class IV
CHEMTREC	Required	Required	Required	Required
Department of Homeland Security	Required	Required	Required	Required
Department of Transportation	Required	Required	Required	Required
Environmental Protection Agency 40 CFR	Required	Required	Required	Required
Governmental Accounting Standards Board				Required
Instrumentation, Systems, and Automation			Required	Required
National Electrical Code			Required	Required
National Fire Protection Association		Required	Required	Required
National Incident Management System	Required	Required	Required	Required
National Sanitation Foundation	Required	Required	Required	Required
Occupational Safety & Health Administration (OSHA)	Required	Required	Required	Required
Office of Hazardous Materials Safety	Required	Required	Required	Required
State/provincial regulations	Required	Required	Required	Required

References

The following are approved as reference sources for the ABC Plant Maintenance Technologist Examinations. Maintenance technologists should use the latest editions of these reference sources to prepare for the exam.

Arasmith Consulting

- *Pumps and Pumping*
- *Electrical Fundamentals for Water and Wastewater*

Website: www.acrp.com/waterwwbooks.html
Phone: (866) 916-7163
Fax: (916) 553-4904
E-mail: acrp@acrp.com

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

- *Operation of Wastewater Treatment Plants, Volume II*
- *Operation and Maintenance of Wastewater Collection Systems, Volume II*
- *Industrial Waste Treatment, Volume II*
- *Water Treatment Plant Operation, Volume II*
- *Water Distribution System Operation and Maintenance*
- *Manage for Success*

To order, contact: Office of Water Programs
California State University, Sacramento
6000 J Street
Sacramento, CA 95819-6025
Website: www.owp.csus.edu
Phone: (916) 278-6142
Fax: (916) 278-5959
E-mail: wateroffice@csus.edu

- Code of Federal Regulations, Title 29, Part 1910 Occupational Safety and Health Standards
  Available at: www.osha.gov; click on Standards

- *Industrial Maintenance*, 2nd edition, by Denis Green and Jonathon F. Gosse
  Available at: www.usabluebook.com

- *Audel Mechanical Trades Pocket Manual*, 4th edition, by Thomas Bieber Davis and Carl A. Nelson Sr.
  Available at: www.borders.com

ABC Testing
A WPI SERVICE

WATER PROFESSIONALS INTERNATIONAL
The Associated Boards of Certification

Superior Water Starts Here™

9400 Plum Drive, Suite 160
Urbandale, IA 50322
+1 (515) 232-3623
gowpi.org
ProfessionalOperator.org
wpi@gowpi.org
Info@ProfessionalOperator.org