A CLASSIFICATION SYSTEM FOR WATER AND WASTEWATER FACILITIES AND PERSONNEL

Part 2 — Personnel Certification and Examination System

Project Report
by the
Association of Boards of Certification
for Operating Personnel
in Water and Wastewater Utilities
ABC Administrative Office
Municipal Building
Ames, Iowa 50010

for the
Office of Water Program Operations
U.S. Environmental Protection Agency
Washington, D.C. 20460
Grant No. T900369-01-2
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EPA Review Notice

This report has been reviewed by the Environmental Protection Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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SECTION I — SUMMARY AND RECOMMENDATIONS

SUMMARY

The Association of Boards of Certification (ABC) has studied the classification of water and wastewater facilities and personnel and has proposed a standard system by which to make such classifications.[1]

"Certification programs for operating personnel in water and/or wastewater facilities have been adopted on either a mandatory or voluntary basis in more than 50 American and Canadian states and provinces. These programs have become an important link in the overall national effort to protect America's water resources and to provide a safe and adequate water supply. The U. S. Environmental Protection Agency (EPA) has recognized this fact through its support and encouragement of state certification programs, as shown by the activities of the Municipal Permits and Operations Division of the Office of Water Program Operations.

"In each certification program, a key element is the classification system for facilities and personnel. For some time there has been a need to develop a sound foundation and improve the present classification systems. In addition, the existing diversity among programs has been recognized as a weakness and an obstacle to reciprocity. These points were made by state program representatives at the Organizational Meeting of the Association of Boards of Certification for Operating Personnel in Water and Wastewater Utilities (ABC) in June, 1972. The primary goal of ABC is to improve and strengthen certification efforts through communication and cooperation among the many certification programs in North America."[1]

The basic elements of the report on the first phase of the ABC studies were:

1. Facility classification by a point system.
2. Operator Classification.
3. Operator Qualifications.
   (a) Experience.
   (b) Education.
   (c) Examination.

Also proposed was an examination procedure based on a modular plan. The second phase of the ABC project reported here is a continuation of the first program. The basic elements of this report are:

1. Identification of personnel requiring certification by law or regulation.

2. Identification of personnel who should be encouraged to be certified to improve the facility operation and to establish a method of entry into the field.

3. A standard definition of the term "responsible charge."

4. A method for classification comparison between ABC and individual certification programs based on education and experience requirements.

5. An examination system and initial examination criteria based on a modular plan. This modular-type examination is divided into four major categories and each category is further divided into four levels of certification based on the required skill level of the position.

RECOMMENDATIONS

1. Each facility must have an operator who is certified to a level that equals the classification level of the facility.

2. Existing and future certification programs should adopt the ABC modular-type examination system for facilities personnel. By basing examinations on *required* skill levels (as opposed to desired knowledge), the objectives of Equal Employment Opportunity Commission (EEOC) or other similar organizations would be met while providing a more valid measurement of an operator's ability to properly operate his facility.

3. To assure increased and meaningful reciprocity between certification boards, a compilation of examination questions based on category and degree of difficulty should be prepared by ABC for use as a tool to help establish minimum skill, knowledge, and ability levels for each operator certification classification.

4. Existing and future certification programs should recognize the need for a career ladder in utility operations and management, and that the practice of certifying only one person per facility is becoming obsolete. Personnel in charge of an operating shift should be certified at no less than one level below that of the facility classification. All other operating personnel who may affect the quality of operation or a final product should be encouraged to become certified at some level.

5. Existing certification programs should compare their current classification system with the ABC system and determine the equivalence of classes.

6. As existing certification programs are periodically reviewed and revised, the ABC classification system for both personnel and facilities should be adopted.

7. Future certification programs and new programs under development should adopt the ABC classification system for both personnel and facilities.

8. Both existing and new certification programs should follow Section II of this report, as a minimum, in identifying those positions for whom certification is *required* and for whom it is *encouraged.*

9. Federal agencies with responsibilities for water and/or wastewater facilities should adopt the ABC classification system if they have none, or determine its equivalency to their own system if one exists. They should also encourage their operating personnel to become certified in the appropriate state administered program.

[1]"A Classification System for Water and Wastewater Facilities and Personnel." Assn. of Boards of Certification, Admin. Off., Municipal Bldg., Ames, Iowa 50010 (June 1974).

SECTION II — CERTIFIED PERSONNEL IDENTIFICATION (Responsible Charge)

Most certification agencies require that those individuals in "responsible charge" be certified. In this study, the term used is "direct responsible charge" (DRC); its definition is:

> The term "direct responsible charge" shall mean, in smaller facilities where shift operation is not required, active daily on-site charge and performance of operation.
>
> In larger facilities where shift operation is required, "direct responsible charge" shall mean both
>
> (a) active, daily, on-site technical direction and supervision; and
>
> (b) active, daily, on-site charge of an operating shift or a major segment of a system or facility.
>
> This definition would include all personnel with responsibility for active, daily, on-site technical direction and supervision in operations within a system.

Personnel requiring certification under this definition have been identified in this study. Some selective and speciality personnel that member boards should encourage to become certified on a *voluntary basis* have also been identified. While ABC does not recommend this latter category of personnel be required to have certification, they should be actively *encouraged* to enter the certification system. This would supply a reservoir of certified personnel for an expanding field.

The job titles used are a consensus of those identified in recent literature. Because there is considerable difference in job titles from one area to another, a brief job description is included with each title.

Illustrations of this certification concept are shown in Tables I, II, III, and IV. This concept is not parallel to general practice in existing certification programs. However, constant improvement in the "state of the art" of water and wastewater treatment, and the increasingly stringent drinking water standards and wastewater effluent requirements, make the concept of one certified person per plant invalid in plants that require the presence of an operator for more than one shift per day.

All personnel should be encouraged to be certified to their highest degree of competency based on their responsibilities and their particular specialities within the field.

In the larger systems, different levels of certification are required because of job level variations and responsibilities. This concept of certification, while not mandatory, should be encouraged by the certifying authority. This approach would more readily assure the public of a certain level of competency and provide the employee a greater means for self-improvement and advancement.

Job Titles and Descriptions

A. Water Treatment Plant

1. Certification *Required*

a. Superintendent (Classes III and IV)

Responsible for administration, operation, and maintenance of entire plant. Exercises direct authority over all plant functions and personnel in accordance with approved policies and procedures. Inspects plant regularly, analyzes and evaluates operation and maintenance functions, initiates or recommends new or improved practices. Develops plans and procedures to insure efficient plant operation. Recommends plant improvements and additions. Coordinates data and prepares or reviews and approves operation reports and budget requests. Controls expenditure of budgeted funds and requests approval for major expenditures, if required. Recommends specifications for major equipment and material purchases. Organizes and directs activities of plant personnel, including training programs. Maintains effective communications and working relationships with employees, government officials, and general public.

b. Assistant Superintendent

Assists in administrative and supervisory duties, under general direction of superintendent. Serves as superintendent in his absence. Aids in analyzing and evaluating operating and maintenance procedures and in developing new or improved practices. Participates in maintenance of operating records, compilation of data, and report preparation. Assists in employee training. Inspects plant. Assists in planning special maintenance work and minor plant alterations, as required.

c. Operations Supervisor

Supervises and coordinates activities of plant operators, laborers, custodians, and other plant personnel. Prepares work schedules subject to approval of superintendent or assistant superintendent. Analyzes recording instrument readings and laboratory tests, and adjusts various plant processes accordingly. Prepares reports and maintains records. Inspects plant to deter-

TABLE I. — Typical Class I Utility Personnel Chart

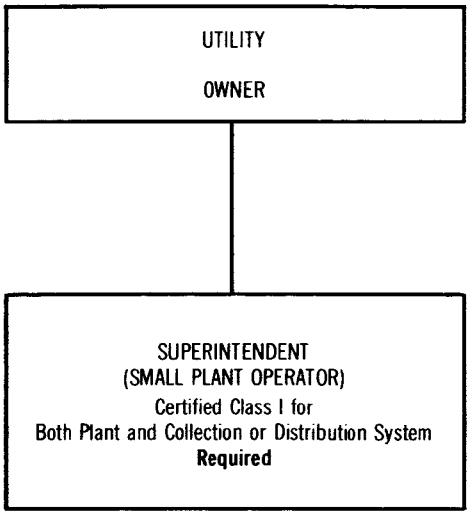


TABLE II. — Typical Class II Utility Personnel Chart

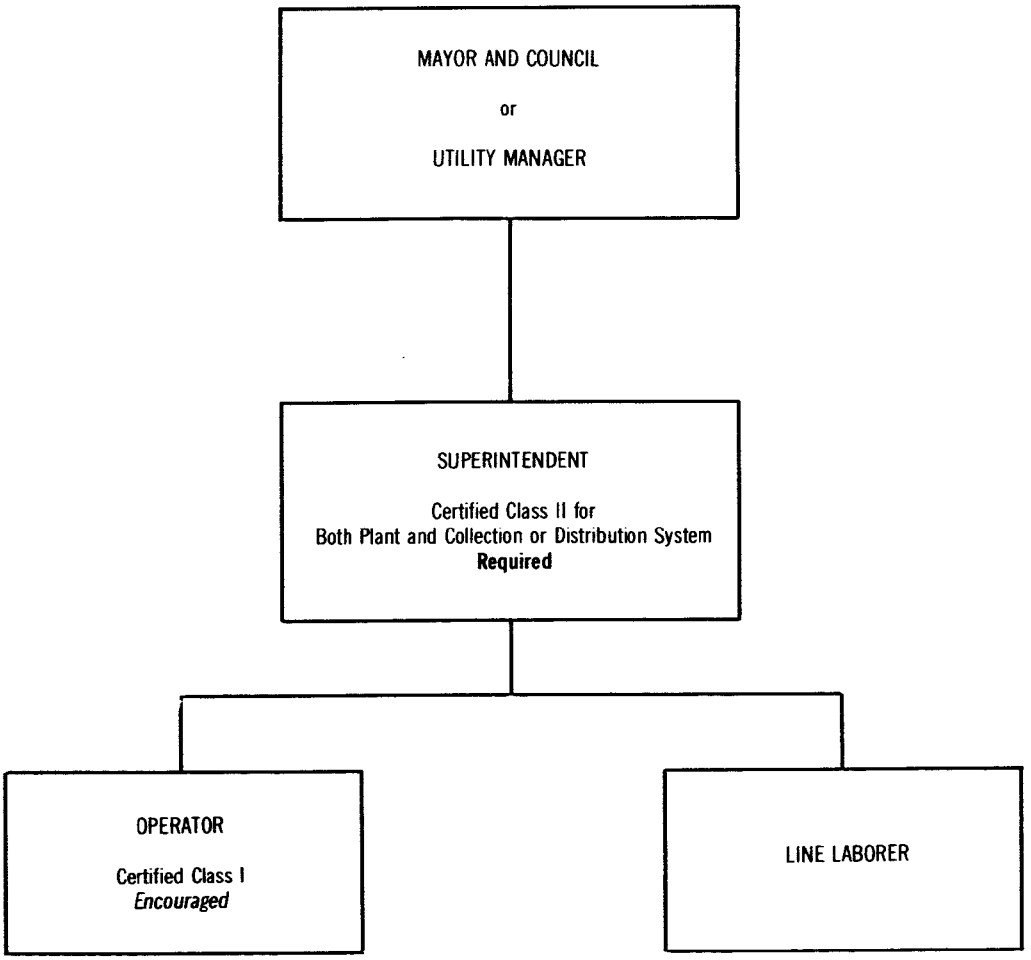


TABLE III. — Typical Class III Utility Personnel Chart

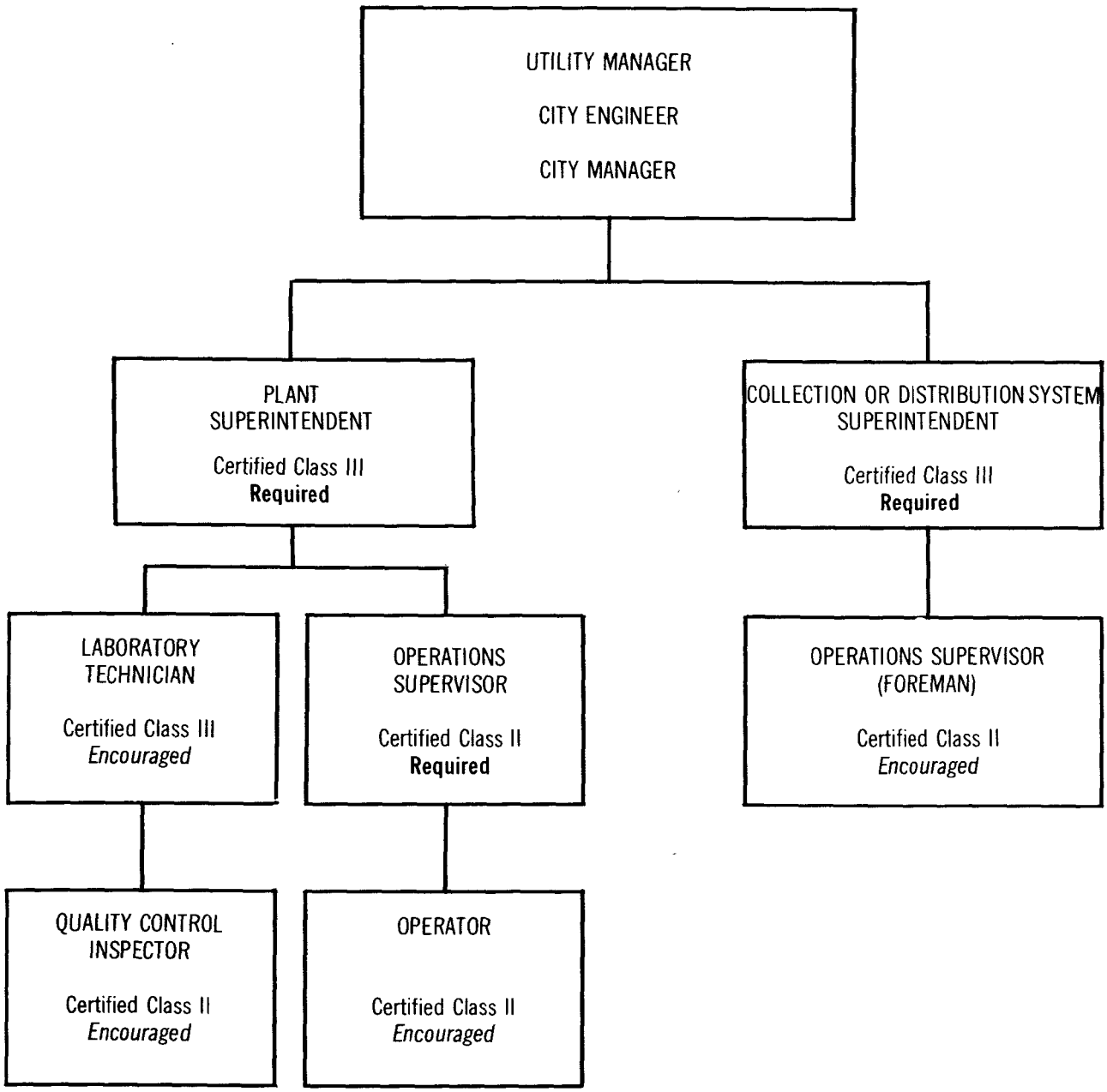
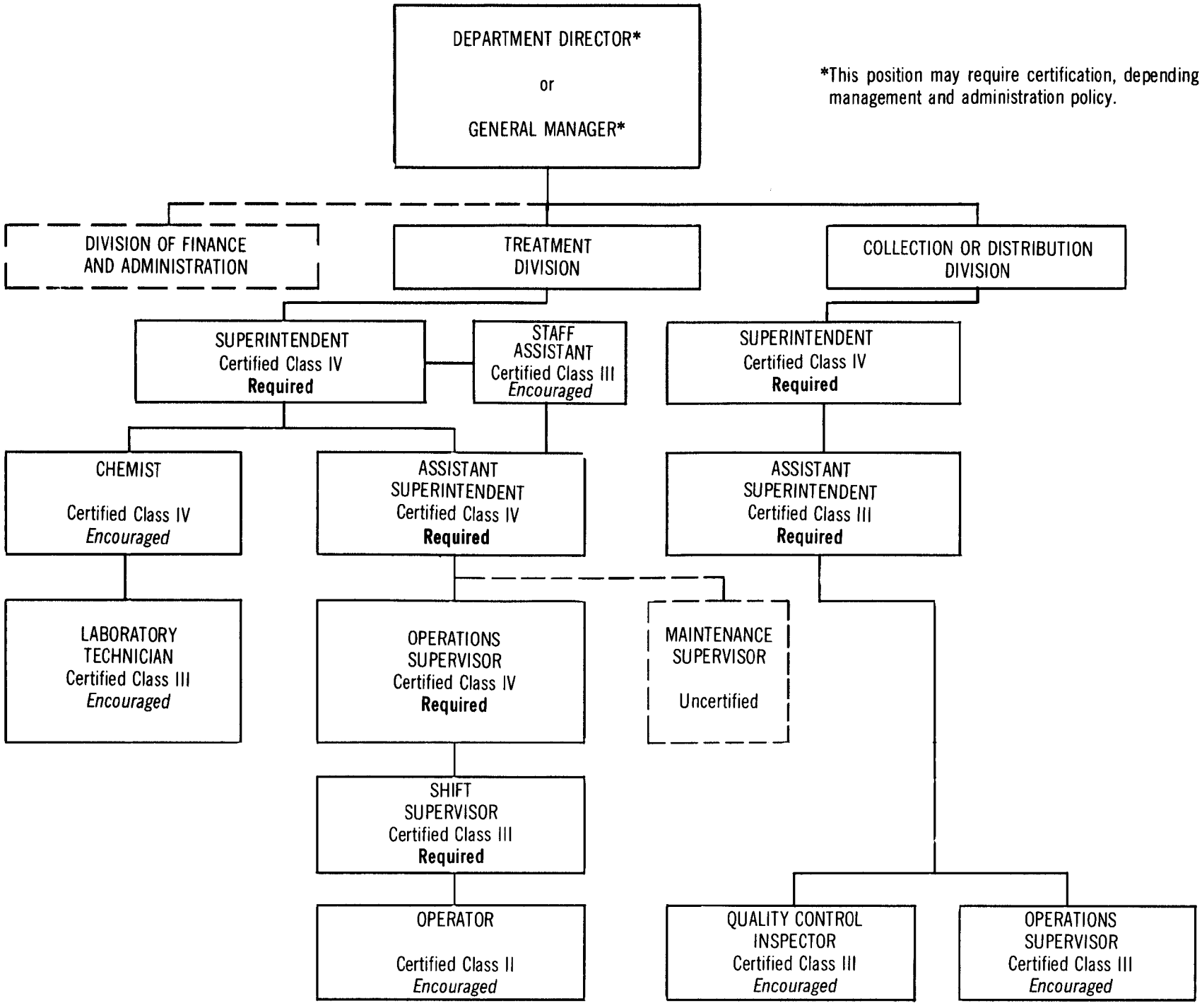


TABLE IV. — Typical Class IV Utility Personnel Chart



mine efficiency of operation, cleanliness, and maintenance requirements. Determines remedial action in emergencies. Conducts training program. Requisitions chemicals and supplies. Performs duties of assistant superintendent in his absence.

d. Shift Supervisor

Supervises operation of plant and plant operating personnel under general direction of superiors. Performs duties of operations or maintenance supervisor in his absence. Supervises, instructs, and assigns specific duties to shift workers. Reviews and evaluates work performance. Participates in training programs. Inspects plant equipment and processes regularly. Analyzes instrument readings and laboratory tests results. Determines sites and causes of any malfunctions. Orders, supervises, or participates in required adjustments or repairs. Maintains and evaluates operating records. Replaces operator or maintenance worker during emergency situation. Communicates with other shift foremen regarding plant conditions.

e. Small Plant Superintendent (Classes I and II)

Operates water treatment equipment to regulate flow and processing of water. Monitors control panels and adjusts valves and gates manually or by remote control to regulate flow of water. Observes variations in operating conditions and interprets meter and gauge readings and test results to determine processing requirements. Starts and stops pumps, engines, and generators to control flows of chemicals and wastewater through the unit processes. May operate and maintain power generating equipment to provide heat and electricity for plant. Operates automotive equipment.

Analyzes and evaluates operation and maintenance functions for water treatment plants processing an average daily flow of less than one (1) million gallons; initiates or recommends new or improved practices.

Controls expenditures of budgeted funds and requests approval for major expenditures, as required. Maintains effective communications and working relationships with other utility employees, government officials, and general public. Composes routine correspondence and handles routine inquiries from the public. Maintains shift log and records meter and gauge readings.

Performs and/or supervises all preventive and corrective maintenance on plant and equipment except where he decides the work must be done by an outside contract. Responsible for maintaining buildings, structures, and grounds. Establishes preventive maintenance programs and regularly inspects plant and mechanical equipment for malfunctions and needed repair. Keeps maintenance records. Performs craft-oriented duties (i.e., electrician, painter, plumber, etc.) along with general custodial tasks as required. Requisitions chemicals and supplies.

2. Certification *Encouraged*

a. Staff Assistant

Assists in administrative and supervisory duties under general direction of the assistant superintendent. Aids in analyzing and evaluating operation and maintenance procedures and in developing new or improved practices. Participates in maintenance of records, compilation of data, and plan and report preparation. Assists in employee training. Inspects plant. Assists in preparation of plans for minor plant alterations and in planning special maintenance work. May represent the superintendent or assistant superintendent in administrative meetings.

b. Operator (Large Plant)

Performs any combination of the following tasks pertinent to controlling operation of the plant. Operates treatment facilities to control flow and processing of raw and finished water. Monitors gauges, meters, and control panels. Observes variations in operating conditions and interprets meter and gauge readings and test results to determine processing requirements. Operates valves and gates either manually or by remote control; starts and stops pumps, engines, and generators to control and adjust flow and treatment processes. Maintains shift log and records meter and gauge readings. Collects samples and performs routine labortory tests and analyses. Performs routine maintenance functions and custodial duties. Operates power generating equipment. Makes operating decisions in absence of supervisory personnel. May perform duties of the shift supervisor in his absence.

c. Chemist/Bacteriologist

Supervises and performs specialized and complex chemical, bacteriological, and physical tests and analyses of raw, partially treated, and treated water and by-products to determine efficiency of plant processes and to insure that the plant effluent meets local,

state, and federal requirements. Conducts or supervises less complex, routine tests. Supervises collection of laboratory samples. When laboratory technicians are present, supervises them and provides routine procedures to be followed. Evaluates and interprets test results for superintendent, establishes test priorities, and prepares reports. Assembles data, maintains records, and prepares periodic reports. Sets up pilot processes when conducting research on improved procedures. Provides direct or indirect instructions to operating personnel regarding chemical requirements and adjustments, and changes or additions to various treatment processes.

d. Laboratory Technician

Performs any combination of routine laboratory tasks. Collects samples of raw, partially treated, and treated water within the plant and treated water throughout the system. Assembles instruments and equipment for analytical or research work. Prepares chemical and bacteriological media, stains, reagents, and test solutions routinely used in laboratory. Operates equipment and performs routine chemical, bacteriological, and physical tests as directed. Maintains test result records and prepares data sheets. Prepares or assists in preparation of reports. Cleans, maintains, and stores instruments and equipment. Maintains inventory and orders supplies. Performs custodial duties in laboratory.

B. Water Distribution System

1. Certification *Required*

a. Superintendent

Responsible for administration and operation of entire system. Exercises direct authority over all system functions and personnel in accordance with approved policies and procedures. Inspects the system regularly. Analyzes and evaluates operation and maintenance functions and initiates or recommends new or improved practices. Develops plans and procedures to insure efficient system operation. Recommends system improvements and extensions. Coordinates data and prepares or reviews and approves operation reports and budget requests. Controls expenditure of budgeted funds and requests approval for major expenditures, if required. Recommends specifications for major equipment and material purchases. Organizes and directs activities of system personnel, including training programs. Maintains effective communications and working relationships with employees, government officials, and general public.

b. Assistant Superintendent

Assists in administrative and supervisory duties under the general direction of the superintendent. Serves as superintendent in his absence. Aids in analyzing and evaluating operation and maintenance procedures, and in developing new or improved practices. Participates in maintenance of operating records, compilation of data, and report preparations. Assists in employee training and safety program. Inspects system. Assists in planning special maintenance work and minor system extensions.

2. Certification *Encouraged*

a. Operations Supervisor

Supervises and coordinates activities of system maintenance personnel, meter men, connection personnel, inspectors, and other system personnel. Prepares work schedules subject to approval of the superintendent or assistant superintendent. Prepares reports and maintains records. Inspects system. Determines remedial action in emergencies. Conducts training program. Requisitions materials and supplies. Performs duties of assistant superintendent in his absence.

b. Quality Control Inspector

Performs routine inspection of the system and collects samples of treated water throughout the system including cross-connection inspection, hydrant flow testing, chlorine residual determinations, and collection of bacteriological samples. Operates equipment and conducts tests as directed. Maintains records and prepares data sheets. Prepares or assists in preparation of reports. Responds to customer complaints.

C. Wastewater Treatment Plant

1. Certification *Required*

a. Superintendent (Classes III and IV)

Responsible for administration, operation, and maintenance of entire plant. Exercises direct authority over all plant functions and personnel in accordance with approved policies and procedures. Inspects plant regularly. Analyzes and evaluates operation and maintenance functions, initiates or recommends new or improved practices. Develops plans and procedures to insure efficient plant operation. Recommends plant

improvements and additions. Coordinates data and prepares or reviews and approves operation reports and budget requests. Controls expenditure of budgeted funds and requests approval for major expenditures, if required. Recommends specifications for major equipment and material purchases. Organizes and directs activities of plant personnel, including training programs. Maintains effective communications and working relationships with employees, government officials, and general public.

b. Assistant Superintendent

Assists in administrative and supervisory duties under the general direction of the superintendent. Serves as superintendent in his absence. Aids in analyzing and evaluating operation and maintenance procedures and in developing new or improved practices. Participates in maintenance of operating records, compilation of data, and report preparation. Assists in employee training. Inspects plant. Assists in planning special maintenance work and minor plant alterations.

c. Operations Supervisor

Supervises and coordinates activities of plant operators, laborers, custodians, and other plant personnel. Prepares work schedules, subject to approval of the superintendent or assistant superintendent. Analyzes recording instrument readings and laboratory test results and adjusts various plant processes accordingly. Prepares reports and maintains records. Inspects plant to determine efficiency of operation, cleanliness, and maintenance requirements. Determines remedial action in emergencies. Conducts training programs. Requisitions chemicals and supplies. Performs duties of assistant superintendent in his absence.

d. Shift Supervisor

Supervises operation of the plant under general direction of superiors. Performs duties of operations or maintenance supervisor in his absence. Supervises, instructs, and assigns specific duties to shift workers. Reviews and evaluates work performance. Participates in training programs. Inspects plant equipment and processes regularly. Analyzes instrument readings and laboratory tests results. Determines site and causes of any malfunctions. Orders, supervises, or participates in required adjustments or repairs. Maintains and evaluates operating records. Replaces operator or maintenance worker during emergency situations. Communicates with other shift foremen regarding plant conditions.

e. Small Plant Superintendent (Classes I and II)

Operates wastewater treatment equipment to regulate flow and processing of wastewater and the waste solids produced. Monitors control panels and adjusts valves and gates manually or by remote control to regulate flow of wastewater and waste solids. Observes variations in operating conditions and interprets meter and gauge readings and test results to determine processing requirements. Starts and stops pumps, engines, and generators to control flows of chemicals, wastewater, and solids through the unit processes. May operate and maintain power generating equipment to provide heat and electricity for plant. May operate incinerator. Operates automotive equipment.

Analyzes and evaluates operation and maintenance functions for wastewater treatment plant processing an average daily flow of less than one (1) million gallons; initiates or recommends new or improved practices. Controls expenditure of budgeted funds and requests approval for major expenditures, as required. Maintains effective communications and working relationships with other utility employees, government officials, and general public. Composes routine correspondence and handles routine inquiries from the public. Maintains shift log and records meter and gauge readings.

Performs and/or supervises all preventive and corrective maintenance on plant and equipment except where he decides the work must be done by an outside contract. Responsible for maintaining buildings, structures, and grounds. Establishes preventive maintenance program and regularly inspects plant and mechanical equipment for malfunctions and needed repair. Keeps maintenance records. Performs craft-oriented duties (i.e., electrician, painter, plumber, etc.), along with general custodial tasks as required. Requisitions chemicals and supplies.

2. Certification *Encouraged*

a. Staff Assistant

Assists in administrative and supervisory duties under general direction of the assistant superintendent. Aids in analyzing and evaluating operations and maintenance procedures and in developing new or improved practices. Participates in maintenance of records, compilation of data, and plan and report preparation. Assists in

employee training. Inspects plant. Assists in preparation of plans for minor plant alterations and in planning special maintenance work. May represent the superintendent or assistant superintendent in administrative meetings.

b. Operator (Large Plant)

Performs any combination of the following tasks pertinent to controlling operation of plant. Operates treatment facilities to control flow and processing of wastewater, sludge, and effluent. Monitors gauges, meters, and control panels. Observes variations in operating conditions and interprets meter and gauge readings and test results to determine processing requirements. Operates valves and gates either manually or by remote control. Starts and stops pumps, engines, and generators to control and adjust flow and treatment processes. Maintains shift log and records meter and gauge readings. Extracts samples and performs routine laboratory tests and analyses. Performs routine maintenance functions and custodial duties. Operates power generating equipment and incinerators. Makes operating decisions in the absence of supervisory personnel. May perform duties of the shift supervisor in his absence.

c. Chemist/Bacteriologist

Supervises and performs specialized and complex chemical, bacteriological, and physical tests and analyses of raw, partially treated, and treated wastewater and by-products to determine efficiency of plant processes and to insure that plant effluent meets local, state, and federal requirements. Conducts or supervises less complex routine tests. Supervises collection of laboratory samples. When laboratory technicians are present, supervises them and provides routine procedures to be followed. Evaluates and interprets test results, establishes test priorities, and prepares reports. Assembles data, maintains records, and prepares periodic reports. Sets up pilot processes when conducting research on improved procedures. Provides direct or indirect instructions to operating personnel regarding chemical requirements and adjustments, changes, or additions to various treatment processes.

d. Laboratory Technician

Performs any combination of routine laboratory tasks. Collects samples of plant influent, partially treated wastewater, sludge, effluent, and other by-products. Assembles instruments and equipment for analytical or research work. Prepares chemical and bacteriological media, stains, reagents, and test solutions routinely used in laboratory. Operates equipment and performs routine chemical, bacteriological, and physical tests as directed. Maintains test result reports. Cleans, maintains, and stores instruments and equipment. Maintains inventory and orders supplies. Performs custodial duties in laboratory.

D. Wastewater Collection System

This section does not apply as a direct legal requirement for many member boards. Many certification laws speak only to water treatment, wastewater treatment, and water distribution. However, the following section is included for information.

1. Certification *Required*

a. Superintendent

Responsible for administration and operation of entire system. Exercises direct authority over all system functions and personnel in accordance with approved policies and procedures. Inspects the system regularly. Analyzes and evaluates operation and maintenance functions. Initiates or recommends new or improved practices. Develops plans and procedures to insure efficient system operation. Recommends system improvements and extensions. Coordinates data and prepares or reviews and approves operation reports and budget requests. Controls expenditures or budgeted funds and requests approval for major expenditures, as required. Recommends specifications for major equipment and material purchases. Organizes and directs activities of system personnel including training programs. Maintains effective communications and working relationships with employees, government officials, and the general public.

b. Assistant Superintendent

Assists in administrative and supervisory duties under the general direction of the superintendent. Serves as superintendent in his absence. Aids in analyzing and evaluating operating and maintenance procedures, and in developing new or improved practices. Participates in maintenance of operating records, compilation of data, and report preparation. Assists in employee training. Inspects system. Assists in planning special maintenance work and minor system extensions.

2. Certification *Encouraged*

a. Operations Supervisor

Supervises and coordinates activities of system maintenance personnel, meter men, connection personnel, inspectors, and other system personnel. Prepares work schedules subject to approval of the superintendent or assistant superintendent. Prepares reports and maintains records. Inspects system. Determines remedial action in emergencies. Conducts training programs. Requisitions materials and supplies. Performs duties of the assistant superintendent in his absence.

b. Quality Control Inspector

Performs routine inspection and monitoring of the system including: sampling and monitoring industrial discharges into the system; inspection of pretreatment facilities connected to the system; assisting plant laboratory personnel in monitoring the receiving stream, as required; and conducting inflow/infiltration studies as directed. Operates equipment and conducts tests as directed. Maintains records and prepares data sheets. Prepares or assists in the preparation of reports.

SECTION III — ENTRY AND ADVANCEMENT THROUGH CERTIFICATION

Certification programs, while developed and administered to protect the public health and the public's investment, also must provide for the entry into and advancement through the field for all qualified personnel. Care must be exercised in the administration of a certification program to avoid the creation of a "closed shop" situation.

If qualified personnel are denied entry into the field by artificial barriers or unrelated educational or training requirements, the certifying authority may expect to be involved in litigation. An unfortunate by-product of this litigation could be the invalidation of the entire certification program.

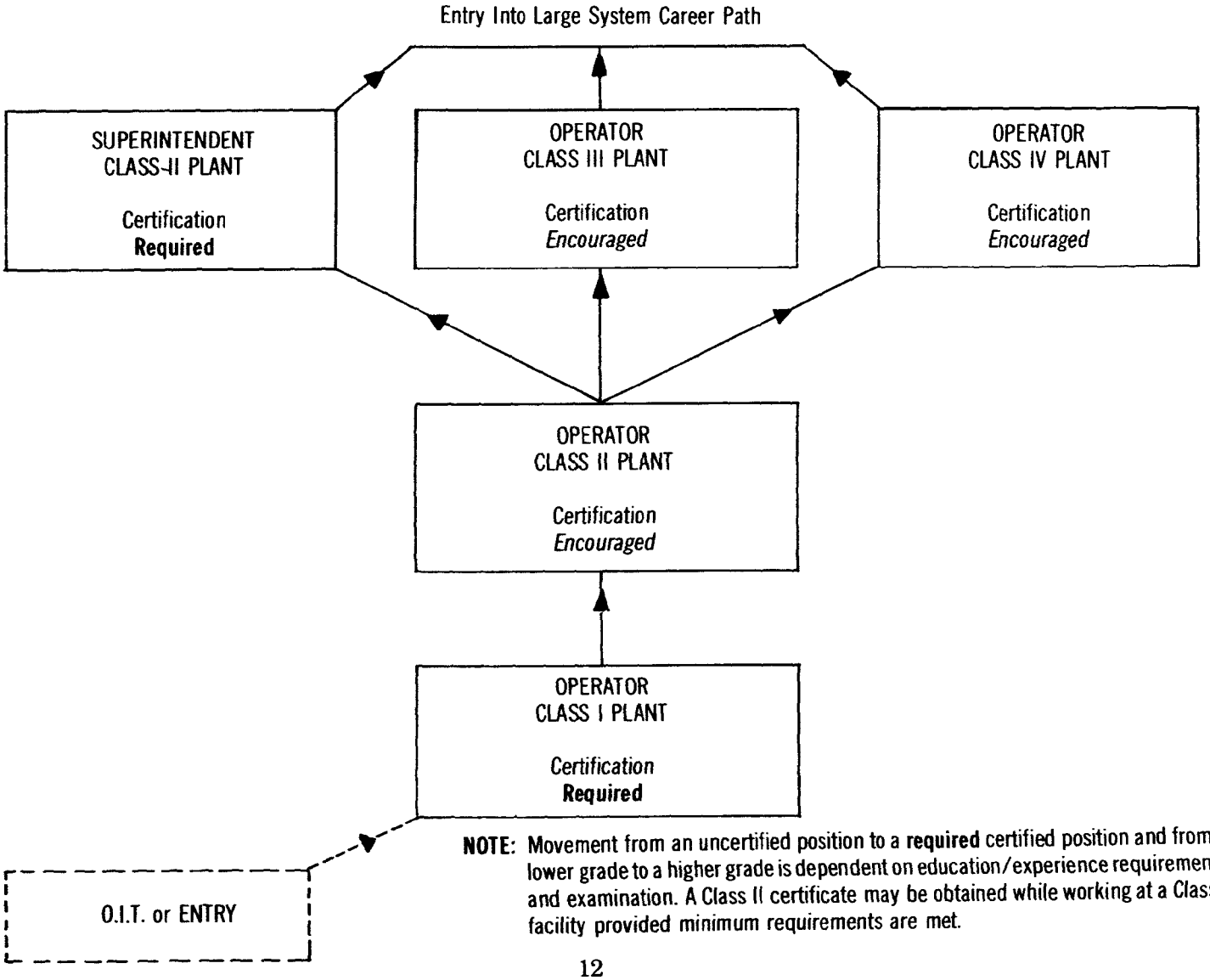
To be totally effective certification programs must have the support and cooperation of operations personnel in the field. It is naive to believe that a regulation or law of this type can be implemented properly without the support of a majority of those people affected by the regulation or law. To provide for this support the affected personnel must be shown that they have a way to advance within the system.

As facility operations to meet new standards become more complex, the need for more competent operating personnel becomes greater. If there is no opportunity for advancement, the personnel have no motivation to improve their skills.

Two possible methods for advancement or "career paths" are illustrated. Table V presents a "career path" for the operator of a small plant, and Table VI presents a "career path" for personnel in large plants.

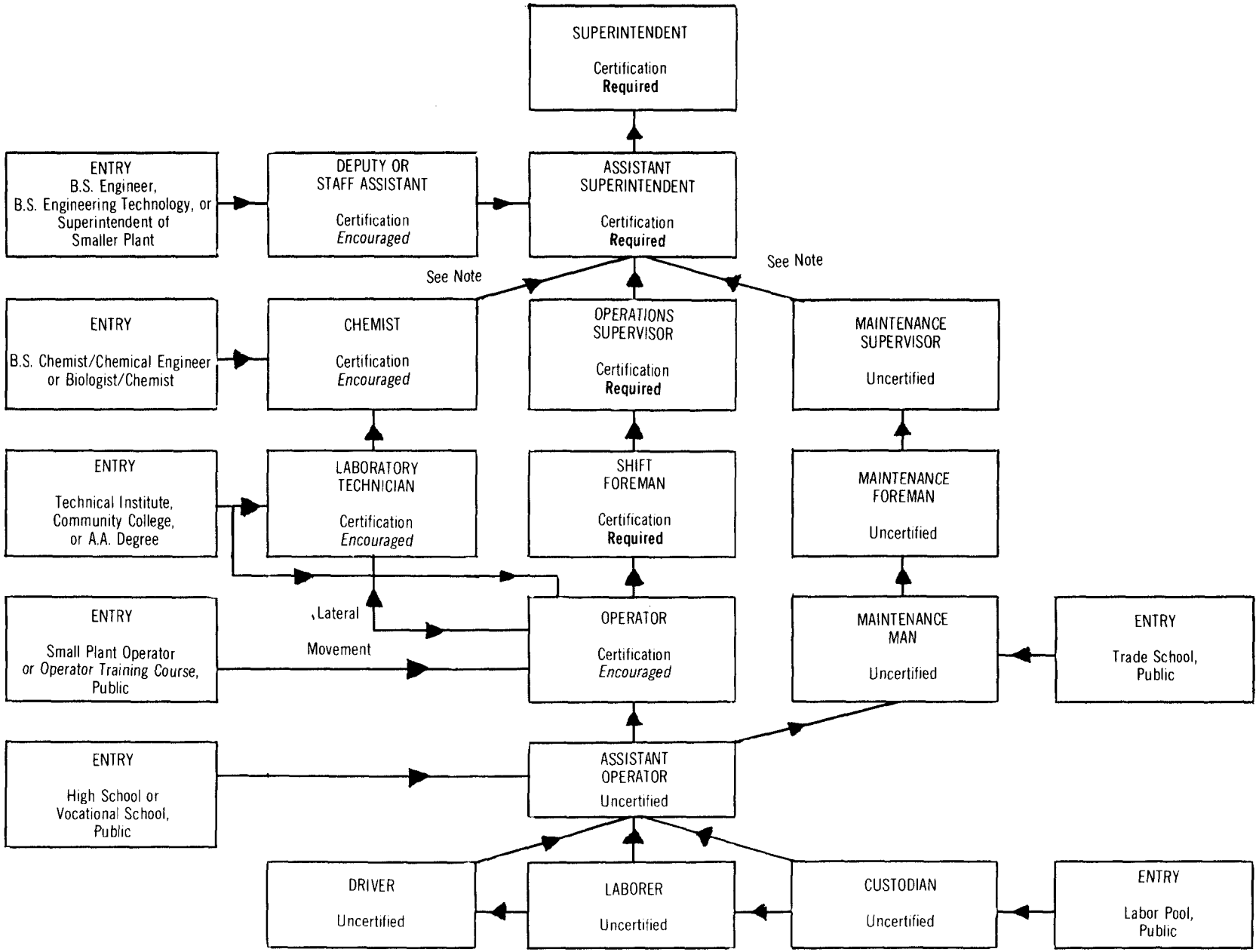
Certification must provide mobility for qualified personnel. While it is understood that some small plant operators will not want to relocate, those desiring to advance themselves must be shown that starting in a Class I facility is not a dead-end path.

TABLE V. — Career Path for Operator of a Small Plant



NOTE: Movement from an uncertified position to a **required** certified position and from a lower grade to a higher grade is dependent on education/experience requirements and examination. A Class II certificate may be obtained while working at a Class I facility provided minimum requirements are met.

TABLE VI. — Career Path for Personnel at a Large Plant



NOTE:
- Movement from an uncertified position to a **required** certified position and from a lower grade to a higher grade is dependent on education/experience requirements and examination.
- Lateral entry as well as vertical entry must be provided to allow for entry into the field at higher levels.
- Entries illustrated are highest level possible based on education/experience. Personnel with higher qualifications may enter at a lower level.

SECTION IV — PERSONNEL CLASSIFICATION SYSTEM

It is desirable that the Personnel Classification System (Table VII) parallel the previously developed facility classification system.

The ABC personnel classification system allows for an unlimited number of specialty certifications to be developed from the basic system or, in programs with limited resources, the basic system alone may be adopted.

In the previous ABC report, the personnel classification system was presented in condensed form. That material is presented here as Tables VII and VIII, but in considerably expanded form, and with additional comments to assist in its use as a guide for making reciprocity determinations.

The changes reflected in Table VII consist of an adjustment in Class III experience requirements from 5 (2.5 DRC)years to 4 (2 DRC)years of experience, an adjustment in Class IV experience requirements from 6 (3 DRC)years to 4 (2 DRC)years of experience, and a restatement of the footnotes supporting Table VII. The minimum experience requirements and DRC requirements are based on the minimum experience required to obtain the necessary background to properly operate a given facility.

This experience requirement, if it is acceptable operating experience, would assure the certifying authority that an operator applying for a particular class of certification had been exposed to other than "normal" operating procedures and had experienced the various cyclic changes affecting facility operation. A major portion of operating knowledge is acquired by actual experience, and knowledge of this type is difficult to test for in a written examination.

Table VIII is arranged in four sections covering experience requirements, formal education requirements, and an extended outline of substitutions for both experience and education.

A short-form tabulation or summary of equivalencies between education and experience as prescribed under the ABC personnel classification system is presented in Table VIII-A. This should simplify the evaluation of any certification program and an individual's qualifications for a specific certification class.

Table VIII-B is a summary, in numerical form, of the number of years of formal education, specialized training, and experience required. It outlines all of the combinations of education, training, and experience that meet ABC guidelines for certification in a specific class.

The personnel classification system is given in Tables VII, VIII, VIII-A, and VIII-B to aid boards in adopting the ABC classification plan.

TABLE VII.— Personnel Classification System—Formal Education and Experience Requirements in Years

Type Facility/System	Operator Class											
	Operator-in-Training		I		II		III			IV		
	Education	Operating Experience	Education	Operating Experience	Education	Operating Experience	Education	Operating Experience	DRC Experience	Education	Operating Experience	DRC Experience
Wastewater Collection (WWC)	12	(a)	12	1	12	3	14	4		16	4	
Wastewater Treatment (WWT)	12	(a)	12	1	12	3	14	4	(b)	16	4	(c)
Water Distribution (WD)	12	(a)	12	1	12	3	14	4	(b)	16	4	
Water Treatment (WT)	12	(a)	12	1	12	3	14	4	(b)	16	4	(c)

(a) Three (3) months operating experience or completion of an approved basic training course. It is recognized that the position operator-in-training (OIT) is not a legally required position in the majority of existing programs. It is included here to illustrate a method of encouraging new entrants in the field to enter into the certification program.

(b) Half (2 years) of the Operating Experience requirement for Class III must be DRC experience in Class II or higher positions.

(c) Half (2 years) of the Operating Experience requirement for Class IV must be DRC experience in Class III or higher positions.

NOTE:

- For Class I, the minimum experience requirement is 1 year, without substitutions.
- For Classes II, III, and IV, substitutions may be made for required experience, but with the limitation that 50 percent of all stated experience requirements (both operating and DRC) must be met by actual on-site operating experience in a plant or system.
- This experience should be obtained under the supervision of a certified operator or under an organized on-the-job training program.
- *Also see* Table 4 "A Classification System for Water and Wastewater Facilities and Personnel." Assoc. of Bds. of Cert., Ames, Iowa (June 1974).

TABLE VIII. — Operator Qualifications: Experience, Education, and Substitutions

EXPERIENCE REQUIREMENTS

Definitions

• Operating experience is defined as time spent at a plant or system in satisfactory performance of operation duties.

• In smaller facilities where shift operation is not required, DRC experience is defined as:

(*a*) Active, daily, on-site charge and performance of operation duties in the next lower certification class.*

• In larger facilities where shift operation is required, DRC experience is defined as both:

(*b*) Active, daily, on-site technical direction and supervision of operation duties in the next lower certification class,* and

(*c*) Active, daily, on-site charge of an operating shift, or a major segment of a system or facility, in the same or next lower certification class.

DRC Requirement

• For Class I or Class II certification, DRC experience is not required.

• For Class III certification, one-half (½) of the operating experience requirement must be DRC experience gained

(*a*) in Class II, if in a top supervisory position, and as specified in the definition of DRC experience,* or

(*b*) in Class II or higher, if on-site charge, and as specified in the definition of DRC experience.

• For Class IV certification, one-half of the operating experience requirement must be DRC experience gained

(*a*) in Class III, if in a top supervisory position, and as specified in the definition of DRC experience,* or

(*b*) in Class III or higher, if on-site charge, and as specified in the definition of DRC experience.

Substitutions for Experience Requirements

Substitutions may be made for required experience for Classes II, III, and IV, but with the limitation that 50 percent of any stated experience requirement (both Operating and DRC) must be met by actual on-site operating experience in a plant or system.

Formal Education

• High school education cannot be credited for substitutional value toward any experience requirement; high school education is in itself a basic requirement for certification at any level.

• Approved relevant† formal academic education at the post-high school or college level may be substituted for experience requirement (either Operating or DRC) on a year-for-year basis, subject to the 50 percent limitation previously described. Thirty (30) semester or 45 quarter hours are considered the equivalent of one (1) year of formal education.

• Education applied in substitution for an experience requirement cannot also be applied to the education requirement.

Operator Training

• Specialized operator training courses, seminars, workshops, approved technical conferences, etc., may be substituted for experience requirement (either Operating or DRC), subject to the 50 percent limitation previously described. Calculation will be based on Continuing Education Units (CEU) as outlined in Section V.

Other Experience

• Partial credit toward operating experience (both Operating and DRC) may be given for experience in plant or system maintenance, in the laboratory, in a different utility division or certification category than that which is being applied for, or in related (allied) trades such as plumbing, as determined or approved by the board.

FORMAL EDUCATION REQUIREMENTS

Definitions

• A High School diploma (12 years) is prescribed as a desirable minimum formal education level for any class of certification.

• Applicants without a high school diploma are strongly encouraged to pass a GED test or equivalent.

• The formal education requirement of fourteen (14) years for Class III includes two (2) years of approved related or relevant college-level formal education in the environmental field, or specialized training (CEU to be determined), or a combination of formal education and training.

• The formal education requirement of sixteen (16) years for Class IV includes four (4) years of approved related or relevant college-level formal education in the environmental field, or specialized training (CEU to be determined), or a combination of formal education and training.

• Related or relevant college-level formal education includes two-year courses or curricula in environmental technology; and four-year B.S. degree programs in environmental engineering, sciences,

and similar programs as approved by the board. Specialized training includes courses, seminars, etc., which have been approved by the board and evaluated in terms of CEU.

• Applicants lacking in formal education can take advantage of specialized operator training courses. These can be substituted for formal education without limit. This assures that an operator who has not had the opportunity to go to college still has the opportunity to advance to the highest certification class.

Substitutions for Formal Education Requirements

Substitutions may be made for required formal education, subject to the following criteria.

Experience

• A year of operating experience (Operating or DRC) may be substituted for two (2) years of grade school, without limitation.

• A year of operating experience (Operating or DRC) may be substituted for one (1) year of high school, without limitation.

• A maximum of one (1) year of DRC experience in a Class II (or higher) position may be substituted for one (1) year of college-level formal education requirement for Class III certification.

• A maximum of one (1) year of DRC experience in a Class III (or higher) position may be substituted for one (1) year of college-level formal education requirement for Class IV certification.

• Experience applied in substitution for an education requirement cannot also be applied to the experience requirement.

Operator Training

• Specialized operator training courses, seminars, workshops, technical conferences, etc., as approved by the board, may be substituted for formal education without limitation. Calculation will be based on CEU.

For example:

Ten (10) classroom or contact hours in an approved course = 1 CEU

Basic operator training course of 36 contact hours = 3.6 CEU

Note: The equivalence or substitutional value of CEU toward education or experience requirements is to be determined by the individual boards and those agencies administering the continuing education program in their area. The ABC will develop guidelines in a future project.

Other Education

• Partial credit toward formal education requirements may be given for academic work or vocational training in allied fields, as determined by the board.

*Experience in the *same class* cannot be credited for DRC experience because the individual could not hold such a position without previously being certified in that class.

†Examples of relevant or related formal education are college-level courses in environmental engineering, environmental science, and others as approved.

TABLE VIII-A.—Education-Experience Equivalencies

Also see Table 4, "A Classification System for Water and Wastewater Facilities and Personnel." Assn. of Bds. of Cert., Ames, Iowa (June 1974)

When Short of Experience—

This Education or Training	May Be Substituted For	Limit
High school education	No credit	—
Relevant college-level education, 1 year	1 year operating or DRC experience	Half of experience requirement
Relevant and specialized operator training as approved, expressed as CEU*	1 year operating or DRC experience	Half of experience requirement

Note: Regardless of education or training available for substitution, 50 percent of any/all experience requirement for Class II, III, or IV must be met in or by actual on-site operating experience.

When Short of Formal Education—

This Experience or Training	May Be Substituted For	Limit
Operating or DRC experience, 1 year	2 years grade school	None
Operating or DRC experience, 1 year	1 year high school	None
In Class III, DRC (only) experience in Class II or higher, 1 year	1 year college-level education	1 year substitution
In Class IV, DRC (only) experience in Class III or higher, 1 year	1 year college-level education	1 year substitution
Relevant and specialized operator training as approved, expressed as CEU*	1 year formal education	None

*This should be expressed by the certifying authority in terms of a specific number of CEU = 1 year formal education with 1 CEU equaling 10 contact hours. The specific number of CEU must be determined by the individual boards and those organizations responsible for continuing education in their respective areas. The ABC will develop guidelines in a future study.

TABLE VIII-B. — ABC Personnel Classification System—Qualification Ranges

Class I		
13 "points"	12 + ½ + ½	Not acceptable; no substitution is allowed for the 1-year experience requirement.
	Base Line— 12 Education and 1 Experience Minimum	
	11 + 2	
	10 + 3	
	(No limit to substitution of experience for education.)	
Class II		
15 "points"	14 + 1	Not acceptable
	Limit of Substitution of Education for Experience— 13½ + 1½ minimum	
	13 + 2	
	Base Line— 12 Education and 3 Experience	
	11 + 4	
	10 + 5	
	(No Limit to Substitution of Experience for Education.)	
Class III		
18 "points"	Limit of Substitution of Education for Experience— 16 + 2 (1 DRC) Minimum	
	15 + 3 (1½ DRC)	
	Base Line— 14 Education + 4 Experience (2 DRC)	
	13 + 5 (3 DRC) (DRC Requirement increases 1:1)	
	Limit of Substitution of Experience for Education— 12 + 6	Not Acceptable
	12 Education + 5 Experience (3 DRC) + 1 Training	Example of an acceptable alternate
	Note that five (5) years is the maximum *Experience* which can be credited toward Class III certification.	

TABLE VIII-B. (Continued)

Class IV

20 "points"	Limit of Substitution of Education for Experience— 18 + 2 (1 DRC) Minimum 17 Education + 2 Experience (1 DRC) Example of an acceptable alternate *u* 1 Training 17 + 3 (1½ DRC) Base Line— 16 Education + 4 Experience (2 DRC) 15 + 5 (3 DRC) (DRC requirement increases 1:1) Limit of Substitution of Experience for Education— 14 + 6 Not acceptable 14 Education + 5 Experience (3 DRC) + 1 Training 13 Education + 5 Experience (3 DRC) Example of an acceptable alternate + 2 Training Note that five (5) years is the maximum *Experience* which can be credited toward Class IV certification.

Notes:

1. "Points" means total of years of education and experience required.
2. All substitutions are 1 year:1 year equivalents. A college "year" is considered 45 quarter hours or 30 semester hours of credit. A CEU "year" will be defined after further study.
3. College-level education must be in the environmental field to be credited.
4. Education can be substituted for Experience, but limited so that 50 percent of any/all experience requirement must be met by actual on-site operating experience. (Note the exception in Class I where the 1-year experience requirement cannot be reduced by education substitution.)
5. Experience can be substituted for high school education in Classes I and II only.
6. Qualified DRC experience can be substituted for college-level education in Classes III or IV only, but it is limited to one (1) year only.

SECTION V — CLASSIFICATION COMPARISON

GENERAL

The next step toward reciprocity is the comparison of a specific state/province certification program with the ABC comparative method described in Section IV. This comparison is carried out with respect to personnel classification only and does not involve the classification or rating of facilities.

The comparison method suggested in this report is based on a system of numerical "points," with each year of formal education and each year of operating experience being assigned one point. Specialized operator training also may be accredited toward the accumulation of equivalent points through the use of Continuing Education Units (CEU). Therefore, any combination of education and experience requirements can be expressed as a specific number of points. Similarly, the education and/or training experience record of any applicant also can be translated into a specific number of numerical points. Subject to the qualifications discussed in the following paragraphs, this makes it a simple matter to compare the personnel classification requirements of any certification program with the ABC recommendations outlined in Section IV.

Any program can be compared easily with another by using the ABC comparative method as a common reference point. Even though both might vary substantially from the ABC recommendations for a given class, if the variances are equal, the two programs can be considered equal in that class. Further evaluation might be unnecessary for reciprocity in that class between two jurisdictions, subject to the decision of a certification board.

It is necessary also to recognize the minimum qualifications. There will be differences in the actual administration of programs that may appear to be similar. It is recognized that there are great variations in the quality of training accepted for fulfilling education requirements at various levels. The "completion" of training is subject to a wide range of interpretation. In some jurisdictions advanced education must be relevant to the field, in others this is not required.

The quality of experience, and even the length of experience (part-time vs. full-time), is subject to considerable difference in actual practice. Under some programs no distinction is made between experience in DRC and experience which is clearly not in responsible charge. Some programs require DRC experience for upper levels of certification and others do not.

Another problem area, perhaps the most serious in reciprocity, is the quality and handling of written examinations for certification. The use of written examinations is almost universal, but it is an area in which those who administer certification programs acknowledge that severe variations exist. Much needs to be done both toward standardization and upgrading of the examination process. Improvement is needed in question content and arrangement, the mechanics of handling and grading the examinations, and in all other aspects of the examination procedure. The ABC currently has projects underway to help resolve these problems.

Nevertheless, it is absolutely essential to make a beginning on a comparison system, both for reciprocity and to help reduce the tremendous diversity that now exists in certification programs. The comparison system and procedures are certain to improve with experience.

The intent of ABC is that any comparison system is voluntary; each certification program is free to use it as it sees fit. Reciprocity procedures or transactions are between the state/province programs which remain free to accept, modify, or reject based on their actual knowledge and experience of the specific program or programs involved.

The ABC recommendations and comparative method provide certification boards with the opportunity for self-evaluation by application of nationally recognized guidelines.

COMPARISON OF SPECIFIC EXAMPLES

1. ABC Classification System

As the first example, the ABC classification system is presented in Table IX as sheets 1, 2, and 3 of a proposed evaluation short form. Note the addition of years of education and experience to arrive at the total "points" required for each class. By means of the summary on sheet 1 and the series of questions outlined on sheet 2, it is envisioned that much of the additional information necessary for evaluation of the quality of a certification program also can be presented or developed.

TABLE IX.—Certification Program Evaluation Short Form—Sheet 1

Program Name _____ Date of Most Recent Change _____

Voluntary _____ or Mandatory _____ Renewal: Annual _____ or _____

Written Examination _____ This Evaluation By _____

(Lowest) I to IV (Highest)

Program Class No.	I	II	III	IV	
Education and Experience Requirements (yr)					
Added as "Points"					
Minimum On-Site Experience (yr), After All Substitutions					
DRC Experience Requirement in Specific Class					

EQUIVALENTS/SUBSTITUTIONS

When Short of Experience—

This Education or Training	May Be Substituted For	Limit
1 yr grade school		
1 yr high school		
1 yr relevant college		
Approved training		

When Short of Education—

This Experience or Training	May Be Substituted For	Limit
1 yr operating experience		
1 yr DRC experience		
Approved training		
Other		

TABLE IX. (cont'd) — Certification Program Evaluation Short Form — Sheet 2

1. Is DRC experience an absolute requirement for the higher certification classes, or may it be substituted for?

2. Is the DRC experience requirement for a given certification class specified to be in the same or next lower certification class or is it unspecified?

3. Is some on-site operating experience an absolute requirement?

4. Is DRC credit given for responsible charge of major divisions or activities within a plant or system?

5. What credit is given for work experience in allied or useful vocations and trades?

6. Are education:experience substitutions on a 1 year:1 year basis?

7. Is education credit given for any or all college-level work or just if relevant to the field?

8. On what basis are approved training courses recognized for credit toward certification?

9. Is a reciprocity-enabling statement included in your law or rules and regulations?

10. If your certification program already has formal reciprocity agreements with other certification programs, please list.

TABLE IX. (cont'd) — Certification Program Evaluation Short Form — Sheet 3

ABC Comparative Method		Program Name _____		
Education and Experience and "Points"		Education and Experience and "Points"	Point Rating vs. ABC	Needed to Match ABC Guidelines
Class I 12 + 1 13	Class No. (Lowest)			
Class II 12 + 3 15	Class No.			
Class III 14 + 4(2) 18	Class No.			
Class IV 16 + 4(2) 20	Class No.			
	Class No. (Highest)			

2. Model Law Regulations

The next example is an evaluation of the 1966 Model Law classification system.[2] As determined in Table X, the numerical rating for Class I and Class II is the same or equal to the ABC system. However, Model Law Class III and Class IV requirements receive a lesser rating in terms of the ABC comparative method. Also shown in Table X are the combinations of additional education and experience which are needed to upgrade the Model Law requirements to meet or match the ABC recommendations. This also could be used as a specification for the additional education and experience needed by an operator who just meets the Model Law requirements but who desires to upgrade his qualifications to those required by the ABC system.

3. Existing State Programs

Tables XI, XII, and XIII present evaluations of three existing state certification programs.

[2] "Model Law and Regulations for Mandatory Certification of Operators of Water Treatment Plants, Water Distribution Systems, and Wastewater Treatment Plants." *Journal Water Poll. Control Fed.*, ***38***, 1898 (Dec. 1966).

TABLE X.—Certification Program Evaluation Short Form—Sheet 1

Program Name Model Law

Date of Most Recent Change 1966

Voluntary _____ or Mandatory X

Renewal: Annual X or _____

Written Examination Yes

This Evaluation By ABC

(Lowest) I to IV (Highest)

Program Class No.	I	II	III	IV	
Education and Experience Requirements (yr)	12 + 1	12 + 3	12 + 3(2)	14 + 5(2)	
Added as "Points"	13	15	15	19	
Minimum On-Site Experience (yr), After All Substitutions	1	2	2	3	
DRC Experience Requirement in Specific Class	None	None	2	2	

EQUIVALENTS/SUBSTITUTIONS

When Short of Experience—

This Education or Training	May Be Substituted For	Limit
1 yr grade school	No credit	—
1 yr high school	No credit	—
1 yr relevant college	2 yr operating or 1 yr DRC experience	Half of experience requirement
Approved training	Not stated	

When Short of Education—

This Experience or Training	May Be Substituted For	Limit
1 yr operating experience	2 yr high school or ½ yr college	Maximum 2 yr high school Maximum 1 yr college
1 yr DRC experience	1 yr college	Maximum 1 yr college
Approved training	High school College	Maximum 1 yr high school Maximum ½ yr college
Other None stated		

TABLE X. (cont'd) — Certification Program Evaluation Short Form — Sheet 2

1. Is DRC experience an absolute requirement for the higher certification classes, or may it be substituted for?

   DRC experience of 2 yr an absolute requirement for III and IV.

2. Is the DRC experience requirement for a given certification class specified to be in the same or next lower certification class or is it unspecified?

   Same or next lower class.

3. Is some on-site operating experience an absolute requirement?

   Yes.

4. Is DRC credit given for responsible charge of major divisions or activities within a plant or system?

   Not stated.

5. What credit is given for work experience in allied or useful vocations and trades?

   At discretion of board.

6. Are education:experience substitutions on a 1 year:1 year basis?

   No; depends on certification class and operating or DRC experience.

7. Is education credit given for any or all college-level work or just if relevant to the field?

   At discretion of board.

8. On what basis are approved training courses recognized for credit toward certification?

   Not stated.

9. Is a reciprocity-enabling statement included in your law or rules and regulations?

   Yes.

10. If your certification program already has formal reciprocity agreements with other certification programs, please list.

TABLE X. (cont'd) — Certification Program Evaluation Short Form — Sheet 3

ABC Comparative Method		Program Name Model Law		
Education and Experience and "Points"		Education and Experience and "Points"	Point Rating vs. ABC	Needed to Match ABC Guidelines
Class I 12 + 1 13	Class No. I (Lowest)	12 + 1 13	Equal	None
Class II 12 + 3 15	Class No. II	12 + 3 15	Equal	None
Class III 14 + 4(2) 18	Class No. III	12 + 3(2) 15	-3	ABC Alternates Include 15 + 3(1½), 13 + 5(3), and (12 Education, 1 training) + 5(3) Needed: 3 yr college, or 2 yr college + 1 yr experience or 1 yr college and 1 yr training plus 2 yr (1 DRC) experience or Combination of above.
Class IV 16 + 4(2) 20	Class No. IV	14 + 5(2) 19	-1	ABC Alternates include 17 + 3(1½) 13 + 7(4) 12 + 8(5) (12 Education, 2 Training) + 6(3) Needed: 1 yr college, or 1 yr (1 DRC) experience or equivalent training or Combination of above.
	Class No. (Highest)			

TABLE XI.—Certification Program Evaluation Short Form—Sheet 1

Program Name Iowa (Joint) Date of Most Recent Change January 1974

Voluntary _____ or Mandatory X Renewal: Annual X or _____

Written Examination Yes This Evaluation By ABC

(Lowest) I to IV (Highest)

Program Class No.	I	II	III	IV	
Education and Experience Requirements (yr)	10 + 1	12 + 2	12 + 6(3) 14 + 2(2)	12 + 10(5) 16 + 4(2)	
Added as "Points"	11	14	18 (High school graduate) 16 (2 yr college)	22 (High school graduate) 20 (4 yr college)	
Minimum On-site Experience (yr), After All Substitutions	1	1	2 (1 for B.S. graduate)	4 (2 for B.S. graduate)	
DRC Experience Requirement in Specific Class	None	None	None	None	

EQUIVALENTS/SUBSTITUTIONS

When Short of Experience—

This Education or Training	May Be Substituted For	Limit
1 yr grade school	½ yr operating experience	Shown above
1 yr high school	1 yr operating or ½ yr DRC experience	Shown above
1 yr relevant college	2 yr operating or 1 yr DRC experience	Shown above
Approved training	29 hr basic training course = 1 yr operating experience 20 hr. laboratory course = ½ yr operating experience Res. or OJT = 2 x length of course	

When Short of Education—

This Experience or Training	May Be Substituted For	Limit
1 yr operating experience	2 yr grade school, or 1 yr high school, or ½ yr college	None stated
1 yr DRC Experience	2 yr high school, or 1 yr college	None stated
Approved training	As stated above, with appropriate substitution credit	None stated

Other GED = high school graduate

TABLE XI. (cont'd) — Certification Program Evaluation Short Form — Sheet 2

1. Is DRC experience an absolute requirement for the higher certification classes, or may it be substituted for?

   No. Experience is a stated period of operating experience *or* ½ that period if DRC experience.

2. Is the DRC experience requirement for a given certification class specified to be in the same or next lower certification class or is it unspecified?

   Same or next lower class.

3. Is some on-site operating experience an absolute requirement?

   Yes.

4. Is DRC credit given for responsible charge of major divisions or activities within a plant or system?

   Not stated.

5. What credit is given for work experience in allied or useful vocations and trades?

   At discretion of board.

6. Are education:experience substitutions on a 1 year:1 year basis?

   No; depends on certification class and operating experience requirement.

7. Is education credit given for any or all college-level work or just if relevant to the field?

   At discretion of board.

8. On what basis are approved training courses recognized for credit toward certification?

   Not stated.

9. Is a reciprocity-enabling statement included in your law or rules and regulations?

   Yes.

10. If your certification program already has formal reciprocity agreements with other certification programs, please list.

TABLE XI. (cont'd) — Certification Program Evaluation Short Form — Sheet 3

ABC Comparative Method

Program Name Iowa (Joint)

Education and Experience and "Points"		Education and Experience and "Points"	Point Rating vs. ABC	Needed to Match ABC Guidelines
Class I 12 + 1 13	Class No. I (Lowest)	10 + 1 11	-2	None
Class II 12 + 3 15	Class No. II	12 + 2 14	-1	None
Class III 14 + 4(2) 18	Class No. III	12 + 6 18 or 14 + 2 16	-2 (DRC) -2	ABC Alternates Include 16 + 2(1) 15 + 3(1½) 13 + 5(3) (12 Education + 1 Training) + 5(3) Needed: 2 yr DRC experience, or 2 yr college + 2 yr DRC experience, or 1 yr college or 1 yr training + 3 yr DRC experience, or Combination of above. Note: The needed years shown could be less if some experience has been DRC experience.
Class IV 16 + 4(2) 20	Class No. IV	12 + 10 22 or 14 + 6 20 or 16 + 4 20		
	Class No. (Highest)			

TABLE XII.—Certification Program Evaluation Short Form—Sheet 1

Program Name Kentucky (Joint) Date of Most Recent Change January 1975

Voluntary _____ or Mandatory X Renewal: Annual X or _____

Written Examination Yes This Evaluation By ABC

(Lowest) I to IV (Highest)

Program Class No.	I	II	III	IV	
Education and Experience Requirements (yr)	12 + 1	12 + 3	12 + 3(2)	16 + 5(2)	
Added as "Points"	13	15	15	21	
Minimum On-site Experience (yr), After All Substitutions	½	2	2	3	
DRC Experience Requirement in Specific Class	None	None	1	1	

EQUIVALENTS/SUBSTITUTIONS

When Short of Experience—

This Education or Training	May Be Substituted For	Limit
1 yr grade school	No credit	—
1 yr high school	No credit	—
1 yr relevant college	2 yr operating or 1 yr DRC experience	6 mo—I 1 yr—II, III 2 yr—IV

Approved training Courses approved by board; 6 hr = 1 Training Credit
45 Training Credits = 1 yr college = 2 yr high school

When Short of Education—

This Experience or Training	May Be Substituted For	Limit
1 yr operating experience	2 yr high school	2 yr
1 yr DRC experience	1 yr college	4 yr

Approved training See above

Other GED = High school graduate

TABLE XII. (cont'd) — Certification Program Evaluation Short Form — Sheet 2

1. Is DRC experience an absolute requirement for the higher certification classes, or may it be substituted for?

   Yes. Absolute requirement for III and IV.

2. Is the DRC experience requirement for a given certification class specified to be in the same or next lower certification class or is it unspecified?

   Same or next lower class.

3. Is some on-site operating experience an absolute requirement?

   Yes.

4. Is DRC credit given for responsible charge of major divisions or activities within a plant or system?

   Yes.

5. What credit is given for work experience in allied or useful vocations and trades?

   At discretion of board.

6. Are education:experience substitutions on a 1 year:1 year basis?

   No; depends on certification class and operating or DRC experience.

7. Is education credit given for any or all college-level work or just if relevant to the field?

   At discretion of board.

8. On what basis are approved training courses recognized for credit toward certification?

   6 classroom hours = 1 Training Credit;
   45 Training Credits = 1 yr college or 2 yr high school.

9. Is a reciprocity-enabling statement included in your law or rules and regulations?

   Yes.

10. If your certification program already has formal reciprocity agreements with other certification programs, please list.

TABLE XII. (cont'd) — Certification Program Evaluation Short Form — Sheet 3

ABC Comparative Method				Program Name Kentucky (Joint)
Education and Experience and "Points"		Education and Experience and "Points"	Point Rating vs. ABC	Needed to Match ABC Guidelines
Class I 12 + 1 13	Class No. I (Lowest)	12 + 1 13	Equal	None
Class II 12 + 3 15	Class No. II	12 + 3 15	Equal	None
Class III 14 + 4(2) 18	Class No. III	12 + 3(2) 15	-3	ABC Alternates Include 15 + 3(1½) 13 + 5(3) (12 Education + 1 Training) + 5(3) Needed: 3 yr college, or 2 yr college + 1 yr experience, or 1 yr college or 1 yr training + 2 yr experience, or Combination of above.
Class IV 16 + 4(2) 20	Class No. IV	16 + 5(2) 21	+1	None
	Class No. (Highest)			

TABLE XIII.—Certification Program Evaluation Short Form—Sheet 1

Program Name Washington (State) Wastewater

Date of Most Recent Change September 1974

Voluntary _____ or Mandatory X

Renewal: Annual X or _____

Written Examination Yes

This Evaluation By ABC

(Lowest) I to IV (Highest)

Program Class No.	IV	III	II	I	
Education and Experience Requirements (yr)	10 + 1	12 + 3	13 + 4(2)	16 + 6(4)	
Added as "Points"	11	15	17	22	
Minimum On-site Experience (yr), After All Substitutions	8 mo	2 yr	2 yr 8 mo	4 yr	
DRC EXPERIENCE Requirement in Specific Class	None	None	2 yr	4 yr	

EQUIVALENTS/SUBSTITUTIONS

When Short of Experience—

This Education or Training	May Be Substituted For	Limit
1 yr grade school	Discretion of board	1/3 minimum required
1 yr high school	Discretion of board	1/3 minimum required
1 yr relevant college	Discretion of board	1/3 minimum required

Approved training Neosho, 1 CS, 44 wk MDTA = 45 Training Credits
Sacramento Study Course = 30 Training Credits
Other college course 6 hr = 1 Training Credit

When Short of Education—

This Experience or Training	May Be Substituted For	Limit
1 yr operating experience	1 yr high school	3 yr
1 yr DRC experience		

Approved training See above

Other GED = High school graduate

TABLE XIII. (cont'd) — Certification Program Evaluation Short Form — Sheet 2

1. Is DRC experience an absolute requirement for the higher certification classes, or may it be substituted for?

   Yes. Absolute requirement for II and I.

2. Is the DRC experience requirement for a given certification class specified to be in the same or next lower certification class or is it unspecified?

   Same or next lower class.

3. Is some on-site operating experience an absolute requirement?

   Yes.

4. Is DRC credit given for responsible charge of major divisions or activities within a plant or system?

   At discretion of board.

5. What credit is given for work experience in allied or useful vocations and trades?

   At discretion of board.

6. Are education:experience substitutions on a 1 year:1 year basis?

   No. At discretion of board.

7. Is education credit given for any or all college-level work or just if relevant to the field?

   At discretion of board.

8. On what basis are approved training courses recognized for credit toward certification?

   6 classroom hours = 1 Training Credit
   45 Training Credits = 1 yr college or 2 yr high school.

9. Is a reciprocity-enabling statement included in your law or rules and regulations?

   Yes.

10. If your certification program already has formal reciprocity agreements with other certification programs, please list.

TABLE XIII. (cont'd) — Certification Program Evaluation Short Form — Sheet 3

ABC Comparative Method		Program Name Washington (State) Wastewater		
Education and Experience and "Points"		Education and Experience and "Points"	Point Rating vs. ABC	Needed to Match ABC Guidelines
Class I 12 + 1 13	Class No. IV (Lowest)	10 + 1 11	-2	10 yr education + 3 yr experience 12 yr education + 1 yr experience 10 yr education + 1 yr training + 2 yr experience, or Combination of above.
Class II 12 + 3 15	Class No. III	12 + 3 15	Equal	None
Class III 14 + 4(2) 18	Class No. II	13 + 4(2) 17	-1	14 yr education + 4(2) experience 13 yr education + 5(2) experience 13 yr education + 1 yr training + 4(2) experience 14 yr education + 1 yr training + 3(2) experience, or Combination of above.
Class IV 16 + 4(2) 20	Class No. I	16 + 6(4) 22	+2	None
	Class No. (Highest)			

4. Summary of Certification Program Criteria

A detailed comparison of individual programs to the ABC personnel classification system was beyond the scope of this project. However, Tables XIV and XV are provided as a ready-reference source. The education and experience requirements listed in these tables are minimums stated in the laws and/or regulations furnished ABC by the participating boards.

For a detailed comparison, interested boards may follow the outline described in Table IX.

TABLE XIV. — Summary of State Programs for Water Plant Personnel Classification

Program	Type Program		Class	Education and Experience	Substitutions and/or Remarks
Alabama	J	M	IV III II I	12+4 or 14+2 or 16+1 12+3 or 14+1 or 16+1 12+1½ 12+1	Acceptable training = Maximum 1 yr. Exp. In All Classes
Arizona	J	M	IV III II I	12+4 or 14+3 or 16+1 0+5 or 10+4 or 12+3 or 14+2 or 16+1 0+4 or 10+3 or 12+2 or 14+1 0+3 or 10+2 or 12+1	At Discretion of the Department In All Classes
Arkansas	W	M	A B C	No Specific Requirement For Any Class	All Operators Must Attend 1 Annual Short Course and 9 Monthly District Meetings per Year
California	W	M	V IV III II I	16+1(1) 16+1(1) or 12+3(1) 16+0 or 12+2 12+1 None	Registered Engineer Requires No Experience in Classes V, IV, or III Training May Be Substituted for High School in Classes II and I
Colorado	J	M	A B C D	16+4(2) 14+4(2) 12+3 12+1	Based on Examination and Experience Acceptable to Board
Florida	W	M	A B C	Any Combination of 12 yr. Training and Exp. Any Combination of 8 yr. Training and Exp. No Specific Requirements	Minimum 4 yr. Exp. Required Minimum 2 yr. Exp. Required Must Pass Examination
Georgia	J	M	I II III IV	17 Points (1 yr. Education = 1 Point; 1 yr. Exp. = 1 Point) 14 Points (Same as Class I) 12 Points (Same as Class I) 10 Points (Same as Class I)	Minimum High School and 2 yr. Exp. Minimum 1 yr. Exp. Minimum ½ yr. Exp. Minimum ½ yr. Exp.
Idaho	W	V	I II III IV	16+1 or 12+9 12+1 12+1 0+1	1 yr. DRC or 2 yr. Exp. = 2 yr. High School or 1 yr. College All Grades Require Minimum of 1 yr. Exp.
Illinois	W	M	A B C D	12+3 or 8+4 12+3 or 8+4 12+1 or 8+2 12+½ or 8+1	1 yr. College = 1 yr. Exp. Maximum of One-Half of Minimum Exp. May be Substituted
Indiana	J	M	SP GF-L PF CT	As Determined By The Commissioner 12+3 12+2 8+3	2 yr. Education = 1 yr. Exp. Minimum 1 yr. Exp. In Classes GF-L, PF, CT
Iowa	J	M	IV III II I	12+10 or 14+6 or 16+4 12+6 or 14+2 12+2 10+1	1 yr. Operating Exp. = 2 yr. Grade School = 1 yr. High School = ½ yr. College 1 yr. DRC = 2 yr. High School = 1 yr. College
Kentucky	J	M	IV III II I	16+5(2) 12+3(2) 12+3 12+1	1 yr. Exp. = 2 yr. High School 2 yr. Exp. = 1 yr. College 1 yr. DRC = 1 yr. College
Maine	J	M		All Qualifications are Determined By Examination	

TABLE XIV. (Continued)

Program	Type Program		Class	Education and Experience	Substitutions and/or Remarks
Maryland	J	M	A B C D	14+5(2) (Minimum Exp. 3 yr.) 12+3(2) (Minimum Exp. 2 yr.) 10+3 (Minimum Exp. 2 yr.) 8+1 (Minimum Exp. 1 yr.)	2 yr. Exp. = 1 yr. College 1 yr. DRC = 1 yr. College
Massachusetts	W	M	IV III II I	16+4 or 16+2 DRC or 12+6 DRC or 12+8 14+5 or 14+3 DRC or 12+4 DRC or 12+6 12+3 or 12+1 DRC or 10+4 DRC or 10+6 10+1	Minimum DRC Cannot Be Substituted in Any Class 2 yr. Exp. = 1 yr. High School
Michigan	W	M	F1, 2 & 3 D1 & 2 M T	Credit System for Education and Experience in Each Class	
Minnesota	J	M	A B C D	16+3 or 12+7 16+2 or 12+5 12+3 8+1	1 yr. Exp. = 1 yr. High School Minimum Exp. Required in Any Class is 1 yr.
Missouri	J	V	A B C D	None+4(2) None+3(1) None+2(1) None+1	Education Requirements Covered In a Modular Type-Examination System 1 yr. College = 1 yr. Exp.
Montana	J	M	1 2 3 4		All Qualifications Determined by Examination
New Jersey	J	M	T-1 T-2 T-3	16+2 12+4 12+3	
New Mexico	J	M	IV III II I	16+2 or 14+4 or 12+5 16+1 or 14+2 or 12+3 or 10+4 12+2 or 10+3 12+1 or 10+2	All Classes Also Require a Minimum Number of Training Hours
New York	W	M	I II III	16+1 12+2 12+½	
North Dakota	J	M	I II III	16+1 or 14+5 or 12+10 12+2 Examination+1 yr. Exp.	
Ohio	W	M	IV III II I	12+5(2) Superintendent Only 12+5 12+3 12+1	B.S. degree = 4 yr. Exp. P.E. License = 4 yr. Exp. 1 yr. Operating Exp. Minimum
Pennsylvania	J	M	A B C D	16+4 or 12+7 or 8+8 (Minimum Exp. 3 yr.) 12+5 or 8+6 (Minimum Exp. 2 yr.) 12+3 or 8+4 (Minimum Exp. 1 yr.) 12+1 or 8+2 (Minimum Exp. ½ yr.)	1 yr. High School = 3 mo. Exp. 1 yr. College = 1 yr. Exp. Short Courses = 3 mo. to 1 yr.
South Carolina	J	M	A B C D	12+6 12+4 12+1 8+1	1 yr. Minimum Experience Required for All Grades 1 yr. College = 1 yr. Exp.

TABLE XIV. (Continued)

Program	Type Program		Class	Education and Experience	Substitutions and/or Remarks
South Dakota	J	M	III II I	16+1 or 12+7 12+3 12+1	1 yr. College = 2 yr. Exp.
Tennessee	J	M	IV III II I	16+1 or 12+7 (Minimum Exp. 1 yr.) 12+1 (Minimum Exp. 1 yr.) 12+1 (Minimum Exp. 1 yr.) 0+1 (Must Pass Written Examination)	1 yr. College = 1½ yr. Exp.
Texas	J	M	A B C D	17+4 or 16+5 or 14+6 or 12+8 16+1 or 12+3 13+2 or 12+3 12+Training	All Grades Also Have a Specific Number of Training Hours Required
Utah	J	V	I II III IV	16+1 or 12+9 12+1 12+1 0+1 (Must Pass Written Examination)	1 yr. College = 2 yr. Exp. 1 yr. Minimum Exp. Required for All Grades
Vermont	W	M	1 2 3 4	12+4 12+2 12+1 8+1 mo.	1 yr. College = 1 yr. Exp. 1 mo. Minimum Exp. Required for All Grades
Virginia	J	M	I II III IV	16+(2) or 12+5(2) 16+(1) or 14+2(1) or 12+5(1) 12+1 or 10+2 8+1	1 yr. DRC = 1 yr. College = 2 yr. High School 2 yr. Exp. = 1 yr. College = 2 yr. High School
Washington	W	M	I II III IV	16+6(4) (Minimum Exp. 4 yr.) 13+4(2) (Minimum Exp. 2 yr. 8 mo.) 12+3 (Minimum Exp. 2 yr.) 10+1 (Minimum Exp. 8 mo.)	1 yr. Operating Exp. = 1 yr. High School All Other Substitutions at Discretion of Board
West Virginia	J	M	1 2 3	12+4 12+1 8+3 mo.	1 yr. College = 1 yr. Exp. 6 mo. Minimum Exp. Required For Classes 1 and 2
Wisconsin	J	M	S1 G1 P1 M1	P.E. or 17+1 or 16+2 or 12+4 16+1 or 14+2 or 12+3 14+1 or 12+2 Training Course	
Wyoming	J	V	A B C D	16+1 or 12+9 14+1 or 12+5 12+1 Examination Only	1 yr. College = 2 yr. Exp.

- W = Water program only.
- J = Joint water/wastewater program.
- M = Mandatory.
- V = Voluntary.
- In Education and Experience column entries such as 14 + 5(2) indicate that of the 5 yr of experience required, 2 yr must be DRC experience.
- P.E. = Registered Professional Engineer.

TABLE XV. — Summary of State Programs for Wastewater Treatment Plant Personnel Classification

Program	Type Program		Class	Education and Experience	Substitutions and/or Remarks
Alabama	J	M	IV	12+4 or 14+2½ or 16+1	Acceptable Training = Maximum 1 yr. Exp.
			III	12+3 or 14+1	Acceptable Training = Maximum 1 yr. Exp.
			II	12+1½	Acceptable Training = Maximum ½ yr. Exp.
			I	8+1½	Acceptable Training = Maximum ½ yr. Exp.
Arizona	J	M	IV	12+4 or 14+3 or 16+1	At Discretion of the Department For All Classes
			III	0+5 or 10+4 or 12+3 or 14+2 or 16+1	
			II	0+4 or 10+3 or 12+2 or 14+1	
			I	0+3 or 10+2 or 12+1	
Arkansas	WW	M	IV	12+5(2)	1 yr. Minimum Required Experience All Grades
			III	12+5	Substitutions at Discretion of the Board
			II	12+3	
			I	12+1	
California	WW	M	V	P.E.+4 or 16+5 or 14+6 or 12+10	2 yr. Exp. Water = 1 yr. Exp. Wastewater
			IV	16+2 or 14+4 or 12+6	Education = 1 yr. Exp.
			III	14+2 or 12+4	Also Based on a Training Point System
			II	12+2 or 12+1½ DRC	
			I	8+1	
Colorado	J	M	A	16+4(2)	Based on Examination and Experience Acceptable to Board
			B	14+4(2)	
			C	12+3	
			D	12+1	
Florida	WW	M	A	Any Combination of 12 yr. Training and Exp.	Minimum 4 yr. Exp.
			B	Any Combination of 8 yr. Training and Exp.	Minimum 2 yr. Exp.
Georgia	J	M	I	17 Points (1 yr. Education = 1 Point; 1 yr. Exp. = 1 Point)	Minimum High School and 2 yr. Exp.
			II	14 Points (Same as Class I)	Minimum 1 yr. Exp.
			III	12 Points (Same as Class I)	Minimum ½ yr. Exp.
			IV	10 Points (Same as Class I)	Minimum ½ yr. Exp.
Idaho	WW	V	I	16+6(4)	1 yr. DRC or 2 yr. Exp. = 2 yr. High School or 1 yr. College
			II	12+4(2)	All Grades Require Minimum of 1 yr. Exp.
			III	10+3	
			IV	8+1	
			V	0+1	
Illinois	WW	M	I	190 Points+6 yr. Exp.	Extensive Point System Varies from 30 Points per Year of Engineering College to 0.2 Points per Hour of Training
			II	120 Points+4 yr. Exp.	
			III	70 Points+3 yr. Exp.	
			IV	40 Points+1 yr. Exp.	
Indiana	J	M	IV	16+5(2) 3 yr. Minimum Exp.	1 yr. College = 1 yr. DRC = 2 yr. Operating Exp.
			III	12+3(2) 2 yr. Minimum Exp.	1 yr. Exp. = 2 yr. High School
			II	12+3; 2 yr. Minimum Exp.	
			I	12+1; 1 yr. Minimum Exp.	
Iowa	J	M	IV	16+4 or 16+(2) or 12+8 or 12+(6)	2 yr. Exp. = 1 yr. High School
			III	14+(3) or 14+5 or 12+6 or 12+(4)	
			II	12+(1) or 12+3 or 10+6 or 10+(4)	
			I	10+1	
Kentucky	J	M	IV	16+5(2)	1 yr. Exp. = 2 yr. High School
			III	12+3(2)	2 yr. Exp. = 1 yr. College
			II	12+3	1 yr. DRC = 1 yr. College
			I	12+1	

TABLE XV. (Continued)

Program	Type Program		Class	Education and Experience	Substitutions and/or Remarks
Maine	WW	M	VI	12 yr. DRC + Examination (Minimum Exp. 6 yr.)	High School Graduate = 1 yr. Exp.
			V	10 yr. DRC + Examination (Minimum Exp. 5 yr.)	1 yr. College = 1 yr. Exp.
			IV	8 yr. DRC + Examination (Minimum Exp. 4 yr.)	
			III	8 + 6 (Minimum Exp. 4 Yr.)	
			II	4 yr. Exp. (Minimum Exp. 1 yr.)	
			I	12 + 2	
Maryland	J	M	A	14 + 5(2) (Minimum Exp. 3 yr.)	1 yr. College = 2 yr. Exp. = 1 yr. DRC
			B	12 + 3(2) (Minimum Exp. 2 yr.)	
			C	10 + 3 (Minimum Exp. 2 yr.)	
			D	8 + 1 (Minimum Exp. 1 yr.)	
Massachusetts	WW	M	VII	8 yr. Exp. + Examination (Minimum Exp. 2 yr.)	Experience Listed Is in the Grade Held or Next Lower
			VI	7 yr. Exp. + Examination (Minimum Exp. 2 yr.)	High School Graduate = 2 yr. Exp.
			V	6 yr. Exp. + Examination (Minimum Exp. 2 yr.)	Engineering Graduate = 4 yr. Exp.
			IV	6 yr. Exp + Examination (Minimum Exp. 2 yr.)	
			III	5 yr. Exp. + Examination (Minimum Exp. 1 yr.)	
			II	3 yr. Exp. + Examination (Minimum Exp. 1 yr.)	
			I	1 yr. Exp. + Examination (Minimum Exp. ½ yr.)	
Michigan	WW	M	A	Credit System for Education and Experience in Each Class	
			B		
			C		
			D		
Minnesota	J	M	A	16 + 3 or 12 + 7	1 yr. Exp. = 1 yr. High School
			B	16 + 2 or 12 + 5	
			C	12 + 3	
			D	8 + 1	
Missouri	J	V	A	None + 4(2)	Education Requirements are Covered In a Modular Type Examination System
			B	None + 3(1)	
			C	None + 2(1)	
			D	None + 1	1 yr. College = 1 yr. Exp.
Montana	J	M	1	All Qualifications Are Determined By Examination	
			2		
			3		
			4		
			5		
Nebraska	WW	V	I	16 + 2(2) or 12 + (6) or 12 + 8	2 yr. Exp. = 1 yr. High School
			II	14 + 3(3) or 12 + 6	
			III	12 + 2(2) or 10 + 3	
			IV	10 + 1	

TABLE XV. (Continued)

Program	Type Program		Class	Education and Experience	Substitutions and/or Remarks
New Hampshire	WW	M	VI	16+8	College Graduate = 3 to 5 yr. Exp.
			V	12+10	
			IV	12+8	
			III	12+6	
			II	12+4	
			I	12+2	
New Jersey	J	M	S-1	16+2 or 14+3 or 12+5	
			S-2	16+1 or 14+2 or 12+4	
			S-3	16+1 or 14+1 or 12+3	
New Mexico	J	M	IV	16+2 or 14+4 or 12+5	All Classes Also Require a Minimum Number of Training Hours
			III	16+1 or 14+2 or 12+3 or 10+4	
			II	12+2 or 10+3	
			I	12+1 or 10+2	
North Carolina	WW	M	IV	16+2 or 14+3 or 12+4	
			III	16+1 or 14+2 or 12+3 or 4 yr. Exp.	
			II	16+0 or 12+½ or 1 yr. Exp.	
			I	12+0 or 8+2	
North Dakota	J	M	I	2 yr. Exp. + Training	No Education Specified; Must Be Able to Pass an Examination
			II	2 yr. Exp. + Training	
			III	3 mo. Exp. + Training	
Ohio	WW	M	IV	12+5(2) Superintendent Only	B.S. Degree = 4 yr. Exp.
			III	12+5	P.E. = 4 yr. Exp.
			II	12+3	1 yr. Operating Exp. Minimum
			I	12+1	
Pennsylvania	J	M	A	16+4 (Minimum Exp. 3 yr.)	1 yr. High School = 3 mo. Exp.
			B	12+5 (Minimum Exp. 2 yr.)	1 yr. College = 1 yr. Exp.
			C	12+3 (Minimum Exp. 1 yr.)	Short Courses = 3 mo. to 1 yr. Exp.
			D	12+1 (Minimum Exp. ½ yr.)	
			E	12+½ (Minimum Exp. ½ yr.)	
			F	12+½ (Minimum Exp. ½ yr.)	
Rhode Island	WW	V	VII	16+10	High School Graduate = 2 yr. Exp.
			VI	16+8	College Graduate = 3 to 5 yr. Exp.
			V	16+6 or 12+10	
			IV	12+8	
			III	8+6	
			II	4 yr. Exp.	
			I	2 yr. Exp.	
South Carolina	J	M	A	12+6 or 16+2	1 yr. Minimum Experience Required for All Grades
			B	12+4	1 yr. College = 1 yr. Exp.
			C	12+1	
			D	8+1	
South Dakota	J	M	III	16+1 or 12+7	1 yr. College = 2 yr. Exp.
			II	12+3	
			I	12+1	
Tennessee	J	M	IV	16+1 or 12+7	1 yr. College = 1½ yr. Exp.
			III	12+1	
			II	12+1	Minimum Exp. 1 yr.
			I	0+1 (Must Pass Written Examination)	
Texas	J	M	A	17+4 or 16+5 or 14+6 or 12+8	All Grades Also Require a Specific Number of Training Hours
			B	16+1 or 12+3	
			C	13+2 or 12+3	
			D	12+Training	

TABLE XV. (Continued)

Program	Type Program		Class	Education and Experience	Substitutions and/or Remarks
Utah	J	V	I	14 + 5(3)	1 yr. College = 2 yr. Exp.
			II	12 + 3(1)	
			III	10 + 3	Minimum Exp. for All Grades = 1 yr.
			IV	8 + 1	V1 yr. Exp.
Virginia	J	M	I	16 + (2) or 12 + 5(2)	1 yr. DRC = 1 yr. College = 2 yr. High School
			II	16 + (1) or 14 + 2(1) or 12 + 5(1)	2 yr. Exp. = 1 yr. College = 2 yr. High School
			III	12 + 1 or 10 + 2	
			IV	8 + 1	
Washington	WW	M	I	16 + 6(4) (Minimum Exp. 4 yr.)	1 yr. Exp. = 1 yr. High School
			II	13 + 4(2) (Minimum Exp. 2 yr. 8 mo.)	All Other Substitutions at
			III	12 + 3 (Minimum Exp. 2 yr.)	Discretion of Board
			IV	10 + 1 (Minimum Exp. 8 mo.)	
West Virginia	J	M	I	12 + 7(2)	1 yr. Exp. = 1 yr. Education
			II	12 + 5	
			III	8 + 3	
			IV	8 + 1	
Wisconsin	J	M	I	17 + 1 or 16 + 2 or 12 + 4 or P.E.	
			II	16 + 1 or 14 + 2 or 12 + 3	
			III	14 + 1 or 12 + 2	
			IV	Training Course	
			V	Demonstrated Aptitude	
Wyoming	J	V	A	16 + 1 or 12 + 9	1 yr. College = 2 yr. Exp.
			B	14 + 1 or 12 + 5	
			C	12 + 1	
			D	Examination Only	
British Columbia	WW	V	I	5 yr. Exp. Credits + Examination	1 yr. College = 1 yr. Exp. (Maximum 3 yr.)
			II	4 yr. Exp. Credits + Examination	
			III	3 yr. Exp. Credits + Examination	Minimum Exp. Required = 1 yr.
			IV	2 yr. Exp. Credits + Examination	
			V	1 yr. Exp. Credits + Examination	

- WW = Wastewater program only.
- J = Joint water/wastewater program
- M = Mandatory.
- V = Voluntary.
- In Education and Experience column entries such as 16 + 6(4) indicate that of the 6 yr. experience required, 4 yr. must be DRC experience.
- P.E. = Registered Professional Engineer.
- B.S. = Bachelor of Science degree.

SECTION VI — EXAMINATION SYSTEM

Personnel and facility classification systems provide the basic framework for the examination system. The ABC program is based on what an operator "needs to know." The system is designed to accept the many diversities in plant design, staffing, and operation and still maintain a basic framework for easier administration.

The examination system is the most critical of the three basic certification requirements (education, experience, and examination). The examination must measure how well, or if, the other two requirements achieved their objective and if the operator has the basic knowledge required to *satisfactorily* operate the plant.

Many of the existing examinations studied fall short of the objective. Unfortunately, some of these examinations are out of date, poorly written, or do not properly test for the needed skill. In addition, it appeared that many of these examinations were not developed by following a carefully prepared outline. Without an examination plan or outline, it is difficult to regularly prepare an examination that will properly measure the operator against the examination objective.

The ABC system is a modular approach that allows the certifying authority to build specific examinations by class and required knowledge.

Tables XVI through XIX indicate the area of competency desired for the various classifications. While the testing units for General and Hydraulics are shown in Classes I through IV, these units could be given in a single examination. The General and Hydraulic areas of knowledge for a Class I system are essentially the same as those for a Class IV system. This "single test" concept could be applied in any of several ways. Those boards using this concept generally use one of the three following methods:

A. A single examination for each module or unit (for example, General, Hydraulics, Quality Control, Supervision/Management) which is answered as completely as possible. All operators take the same examination with the passing score being different for each certification class. If an operator passes an examination module in the next higher certification class, he is not required to repeat that module if he seeks certification advancement within a specified period of time.

For example:	Class I	— 50 per cent
	Class II	— 60 percent
	Class III	— 70 percent
	Class IV	— 80 percent

B. A single examination for both General and Hydraulics in which all classes must make the same passing score. The other modules or units would be separate examinations for each certification class.

C. A single examination for each module or unit divided into distinct classes or levels of difficulty. The class is determined by the number of these sub-units completed and passed by the operator. These sub-units are marked and titled so that the operator taking the examination is aware of the level for which he is being examined. In this way the operator is not required to answer questions beyond the requirements of the classification level for which he is being examined.

For example:	Questions 1-25	Class I	STOP HERE
	Questions 26-50	Class II	STOP HERE
	Questions 51-75	Class III	STOP HERE
	Questions 76-100	Class IV	STOP HERE

All classes start with question 1 and continue through the examination, with increasingly difficult questions, until they have completed the portions for the desired level of classification.

TABLE XVI. — Modular Examination System Water Treatment Plant Personnel

(Shaded Areas Indicate Modules Required For Each Certified Class)

PERSONNEL POSITION	CATEGORIES (Module or Unit)	EXAMINATION LEVEL			
		I	II	III	IV
WT-1	General				
	Hydraulics				
	Quality Control				
	Superv/Management				
WT-II	General				
	Hydraulics				
	Quality Control				
	Superv/Management				
WT-III	General				
	Hydraulics				
	Quality Control				
	Superv/Management				
WT-IV	General				
	Hydraulics				
	Quality Control				
	Superv/Management				
WT-1 *SELECTED QUALITY CONTROL LIMITED TO OPERATOR's PLANT	General				
	Hydraulics				
	Quality Control*				
	Superv/Management				
WT-II *SELECTED QUALITY CONTROL LIMITED TO OPERATOR's PLANT	General				
	Hydraulics				
	Quality Control*				
	Superv/Management				

NOTE: Quality Control Module includes both process operation and required laboratory controls

TABLE XVII. — Modular Examination System Wastewater Treatment Plant Personnel

(Shaded Areas Indicate Modules Required For Each Certified Class)

PERSONNEL POSITION	CATEGORIES (Module or Unit)	EXAMINATION LEVEL			
		I	II	III	IV
WWT-I	General				
	Hydraulics				
	Quality Control				
	Superv/Management				
WWT-II	General				
	Hydraulics				
	Quality Control				
	Superv/Management				
WWT-II	General				
	Hydraulics				
SELECTED	Quality Control				
ACTIVATED SLUDGE	Superv/Management				
WWT-II	General				
	Hydraulics				
SELECTED	Quality Control				
TRICKLING FILTER	Superv/Management				
WWT-III	General				
	Hydraulics				
	Quality Control				
	Superv/Management				
WWT-IV	General				
	Hydraulics				
	Quality Control				
	Superv/Management				

TABLE XVIII. — Modular Examination System Water Distribution System Personnel

(Shaded Areas Indicate Modules Required For Each Certified Class)

PERSONNEL POSITION	CATEGORIES (Module or Unit)	EXAMINATION LEVEL			
		I	II	III	IV
WD-I	General				
	Hydraulics				
	Quality Control				
	Superv/Management				
WD-II	General				
	Hydraulics				
	Quality Control				
	Superv/Management				
WD-III	General				
	Hydraulics				
	Quality Control				
	Superv/Management				
WD-IV	General				
	Hydraulics				
	Quality Control				
	Superv/Management				
WD-I SPECIALITY (EXAMPLE)	General				
	Hydraulics				
	Cross-Conn. Control				
WD-II SPECIALITY (EXAMPLE)	General				
	Hydraulics				
	Cross-Conn. Control				

TABLE XIX. — Modular Examination System Wastewater Collection System Personnel

(Shaded Areas Indicate Modules Required For Each Certified Class)

PERSONNEL POSITION	CATEGORIES (Module or Unit)	EXAMINATION LEVEL			
		I	II	III	IV
WWC-I	General				
	Hydraulics				
	Quality Control				
	Superv/Management				
WWC-II	General				
	Hydraulics				
	Quality Control				
	Superv/Management				
WWC-III	General				
	Hydraulics				
	Quality Control				
	Superv/Management				
WWC-IV	General				
	Hydraulics				
	Quality Control				
	Superv/Management				
WWC-I SPECIALITY (EXAMPLE)	General				
	Hydraulics				
	Indust. Waste Mont.				
WWC-II SPECIALITY (EXAMPLE)	General				
	Hydraulics				
	Indust. Waste Mont.				

The ABC system, by using the desired areas of competency indicated, provides the outline of four categories or modules of knowledge to be used in preparing the examination.

These categories are:

1. GENERAL

   This category will cover the general knowledge (math, safety, etc.) required for *all* operators regardless of certification class, will be a single examination for all operators, and will require the same passing score for all operators.

2. HYDRAULICS

   This category will cover the basic hydraulic or mechanical knowledge (pumps, valves, etc.) required for *all* operators regardless of certification class, will be a single examination for all operators, and will require the same passing score for all operators.

3. QUALITY CONTROL

   This category will include the more complex questions of process operation, and will be given in a modular form based on the knowledge needed to operate a specific class of facility. These modules will be separate examinations for each class.

4. SUPERVISION/MANAGEMENT

   This category will include increasingly complex questions based on the needed knowledge in each class. As in the Quality Control category, this category will be divided into separate modules for each class.

The ABC system would further require that the operator being examined must make a passing score in *each* of the categories and not a combined score on all categories. Adequate knowledge in each of the categories is essential for proper operation and each must be considered separately.

The basic ABC system will require four examinations for each class:

1. GENERAL—same for all classes.
2. HYDRAULICS—same for all classes.
3. QUALITY CONTROL—by class.
4. SUPERVISION/MANAGEMENT—by class.

The General and Hydraulics modules would not have to be retaken if an operator is examined for the next higher certification class within three years after the examination was taken originally.

While these modules would be four separate examinations, they would be given as a single "package" for each class. This system would be no more difficult to administer than the present systems used by certification agencies, and it enables a board to more easily monitor the quality of examinations and to identify "knowledge deficiency" areas.

The ABC system can be structured and expanded to permit either selective or speciality certification based on a specific process or responsibility. Selective certification, as identified by a specific type of treatment process, will be accomplished by developing selective "Quality Control" examination sub-modules.

For example, in wastewater treatment facilities the system could be expanded to include specific modules for specific type and classes of plants:

1. Trickling Filter.
2. Activated Sludge.
3. Physical/Chemical (Industrial).
4. Package Plants and Lagoons.

The selective certification process permits a board to develop a more "narrow" certification classification system within its basic structure for industry or a unit process in a municipal treatment plant. The Quality Control sub-module examination, for example, would cover only the selected industrial or municipal treatment process category. The certificate issued would be so identified, such as "Wastewater Treatment Plant Operator Class III — Activated Sludge."

Speciality certification is based on an individual's specific area of responsibility within a facility or system and not on the treatment process involved.

For example, in wastewater treatment facilities, a laboratory technician would be given an examination covering the General and Hydraulic modules plus the Quality Control and Management/Supervision modules one level below operator requirements for the facility, *and* an additional laboratory examination based on the requirements of a specific class of plant. The system recognizes that the needed level of operation knowledge for the specialist is different from that required of the person in responsible charge of the total facility.

The ABC examination system provides for the examination of those personnel required by law or regulation and also provides, with a minimum of additional administrative problems, a method to expand the examination process to include those personnel that should be encouraged to enter into the certification program.

SECTION VII — EXAMINATION CRITERIA

Any meaningful program to establish reciprocity of certification must first establish a program or system of examinations based on common, minimum criteria. While it is beyond the scope of this project to formulate standard examinations or questions, the examination criteria required to identify the skill levels required for each class must be identified.

Tables XX and XXI illustrate the basic subjects to be included in the examinations for the various classifications. Tables XXII through XXV further define these basic subjects by content and skill level desired. Table XXVI presents an outline of suggested criteria for Wastewater Treatment Plant Personnel as an example.

The skills required in the General and Hydraulics modules, as previously noted, are basic skills required by all personnel requiring certification under law. These two modules would be given to all personnel.

In addition to the job descriptions listed in Section II, certain basic qualifications are required for each certified position. These qualifications are basic to the position and, to some degree, will determine the level of difficulty of the examinations. These qualifications also are outlined or inferred in the various state laws and regulations and must be considered in preparing examinations. An example of a regulation that determines a skill level requirement of personnel in responsible charge is the National Pollutant Discharge Elimination System (NPDES) permit. The NPDES permit establishes specific laboratory tests for specific treatment plants as well as administrative procedures and operation and maintenance requirements based on size and type of facility. The recently enacted Federal Safe Drinking Water Act (Public Law 93-523) will have a similar effect on water treatment facilities.

TABLE XX. — Subject Areas — Operation Examinations

A. **General Module** (same for all classes)
   1. Basic and Applied Mathematics
   2. Basic and Related Science
   3. Safety
   4. Communication Skills

B. **Hydraulics Module** (same for all classes)
   1. Pumps
   2. Pipes and Valves
   3. Meters and Chemical Feed Equipment
   4. Equipment Maintenance

C. **Quality Control Module** (increasing difficulty by class)
   1. Process Operation and Theory
   2. Treatment Unit Operation
   3. Laboratory Control and Procedures

D. **Supervision/Management Module** (increasing difficulty by class)
   1. Records and Reports
   2. Financial
   3. Legal
   4. Public Relations
   5. Personnel
   6. Emergency Procedures

TABLE XXI. — Subject Areas — Collection/Distribution System Examinations

A. **General Module** (same for all classes)
   1. Basic and Applied Mathematics
   2. Basic and Related Science
   3. Safety
   4. Communication Skills

B. **Hydraulics Module** (same for all classes)
   1. Pumps
   2. Pipes and Valves
   3. Meters and Chemical Feed Equipment
   4. Maintenance

C. **Quality Control Module** (increasing difficulty by class)
   1. System Operation and Theory
   2. Sampling and Monitoring
   3. Field Analyses

D. **Supervision/Management Module** (increasing difficulty by class)
   1. Records and Reports
   2. Financial
   3. Legal
   4. Public Relations
   5. Personnel
   6. Emergency Procedures

TABLE XXII. — Basic Subject Definitions for General Module
(Same for all Classes)

A. **Basic and Applied Mathematics**
   1. Fractions
   2. Decimals
   3. Addition and Subtraction
   4. Multiplication and Division
   5. Percentage
   6. Measurement
   7. Compound Units
   8. Metric System
   9. Units of Expression
   10. Conversion
   11. Area and Volume
   12 Detention Time
   13 Overflow Rates
   14. Hydraulic and/or Organic Loadings
   15. Chemical Feed
   16. Graphics
   17. Efficiency

B. **Basic and Related Science**
   1. Characteristics of Water/Wastewater
   2. Hydrological Cycle
   3. Basic Physics
      a. Energy
      b. Machines
      c. Electricity
   4. Basic Chemistry
      a. Composition of Matter
      b. Symbols and Formula
      c. Reactions
      d. Equations
      e. Expression of Concentration

C. **Safety**
   1. First Aid
   2. Safety Hazards
   3. Safety Equipment
   4. Personal Health
   5. Housekeeping
   6. Emergency Procedures

D. **Communication Skills**
   1. Reading for Understanding
   2. Writing Skills
   3. History of the Field
   4. Telephone Procedures
   5. Blueprint Reading

TABLE XXIII. — Basic Subject Definitions for Hydraulics Module
(Same for all Classes)

A. Pumps
1. Types of Pumps and Applications
2. Pump Controls
3. Pressure and Head

B. Pipe and Valves
1. Types of Pipe and Applications
2. Types of Valves and Applications
3. Line and Grade

C. Meters and Chemical Feed Equipment
1. Types of Meters and Applications
2. Types of Chemical Feed Equipment and Applications
3. Meter Controls
4. Chemical Feed Equipment Controls

D. Equipment Maintenance
1. Pump Maintenance
2. Line and Valve Maintenance
3. Meter Maintenance
4. Electric Motor Maintenance
5. Electrical and Control Troubleshooting

TABLE XXIV. — Basic Subject Definitions for Quality Control Module

A. Water Plant Personnel
1. Process Operation and Theory
   a. Preliminary Treatment
   b. Flocculation and Clarification
   c. Filtration
   d. Disinfection
   e. Taste and Odor Control
2. Treatment Unit Operation
   a. Screening Devices
   b. Mixing Equipment
   c. Clarification Equipment
   d. Filtration Equipment
3. Laboratory Control and Procedures
   a. Class I Plants
   b. Class II Plants
   c. Class III Plants
   d. Class IV Plants

B. Wastewater Plant Personnel
1. Process Operation and Theory
   a. Preliminary Treatment
   b. Primary Treatment
   c. Secondary Treatment
   d. Tertiary Treatment
   e. Sludge Digestion
   f. Sludge Handling
   g. Advanced Waste Treatment
2. Treatment Unit Operation
   a. Lagoons
   b. "Package" Plants
   c. Screening Devices
   d. Grit Removal Equipment
   e. Primary Settling Units
   f. Aeration Units
   g. Secondary Settling Units
   h. Trickling Filters
   i. Anaerobic Digesters
   j. Aerobic Digesters
   k. Sludge Dewatering Equipment
   l. Chlorination
   m. Advanced Treatment Units
3. Laboratory Control and Procedures
   a. Class I Plants
   b. Class II Plants
   c. Class III Plants
   d. Class IV Plants

C. Water Distribution Personnel
1. System Operation and Theory
   a. Ground and Elevated Storage
   b. Booster Pumping
   c. Booster Chlorination
   d. Sterilization
   e. Valving

2. Sampling and Monitoring
   a. Sample Collection
   b. Cross-Connection Control
   c. System Inspection
3. Field Analyses
   a. pH
   b. Chlorine Residual
   c. Taste and Odor

D. Wastewater Collection Personnel

1. System Operation and Theory
   a. Manholes
   b. Pumping Stations
   c. Flow Control Structures
   d. Pre-Chlorination
2. Sampling and Monitoring
   a. Sample Collection
   b. Inflow/Infiltration
   c. Industrial Pre-Treatment
3. Field Analyses
   a. Temperature
   b. pH
   c. Chlorine Residual

TABLE XXV. — Basic Subject Definitions for Supervision/Management Module

A. Records and Reports

1. State and Local
2. Federal
3. Operation
4. Maintenance
5. Laboratory
6. Personnel

B. Financial

1. Purchasing
2. Inventory Control
3. Budget Preparation
4. Budget Review
5. Bonding and Grant Procedures

C. Legal

1. State and Local Regulations
2. Federal Regulations
3. Local Responsibility
4. Role of Regulatory Agency
5. Right-of-Way Acquisition
6. Code Enforcement

D. Public Relations

1. Customer Relations
2. Complaint Investigation
3. Public Speaking
4. Contractor Supervision

E. Personnel

1. Planning Work
2. Responsibility of Supervisors
3. Employee Management and Evaluation
4. Employee Training
   a. Safety
   b. Operational

E. Emergency Procedures

1. Bypass Reporting
2. Major System Break
3. Major Treatment Unit Failure
4. Total Plant Failure
5. Hazardous Materials
6. Alternate Modes of Operation
7. Labor Strike

TABLE XXVI. — Suggested Examination Criteria for Wastewater Treatment Personnel

Module No.	Module	Required Skill Level by Class			
		Class I	Class II	Class III	Class IV
I.	**General** (Same for all Classes)				
	A. Basic and Applied Mathematics	X	X	X	X
	B. Basic and Related Science	X	X	X	X
	C. Safety	X	X	X	X
	D. Communication Skills	X	X	X	X
II.	**Hydraulics** (Same for all Classes)				
	A. Pumps	X	X	X	X
	B. Pipe and Valves	X	X	X	X
	C. Meters and Chemical Feed	X	X	X	X
	D. Equipment Maintenance	X	X	X	X
III.	**Quality Control**				
	A. Process Operation and Theory				
	1. Preliminary Treatment	X	X	X	X
	2. Primary Treatment	X	X	X	X
	3. Secondary Treatment	X	X	X	X
	4. Tertiary Treatment		X	X	X
	5. Sludge Digestion		X	X	X
	6. Sludge Handling		X	X	X
	7. Advanced Waste Treatment			X	X
	B. Treatment Unit Operation				
	1. Lagoons	X	X	X	X
	2. "Package" Plants	X	X	X	X
	3. Screening Devices	X	X	X	X
	4. Grit Removal Equipment		X	X	X
	5. Primary Settling Units		X	X	X
	6. Aeration Units		X	X	X
	7. Secondary Settling Units				
	8. Trickling Filters		X	X	X
	9. Anaerobic Digestion		X	X	X
	10. Aerobic Digestion		X	X	X
	11. Sludge Dewatering			X	X
	12. Chlorination	X	X	X	X
	13. Advanced Units				X
	C. Laboratory Control and Procedures				
	1. Temperature	X	X	X	X
	2. ph	X	X	X	X
	3. Biochemical Oxygen Demand	X	X	X	X
	4. Dissolved Oxygen	X	X	X	X
	5. Suspended Solids	X	X	X	X
	6. Settleable Solids	X	X	X	X
	7. Fecal Coliform	X	X	X	X
	8. Residual Chlorine	X	X	X	X
	9. Sample Collection	X	X	X	X
	10. Visual Monitoring	X	X	X	X
	11. Total Coliform		X	X	X
	12. Volatile Acids		X	X	X
	13. Biology		X	X	X
	14. Stream Monitoring		X	X	X
	15. Alkalinity		X	X	X
	16. Acidity		X	X	X
	17. Sample Preservation		X	X	X

TABLE XXVI. (Continued)

Module No.	Module	Required Skill Level by Class			
		Class I	Class II	Class III	Class IV
	18. Process Monitoring		X	X	X
	19. Chemical Oxygen Demand			X	X
	20. System Monitoring			X	X
	21. Oil and Grease			X	X
	22. Total Solids			X	X
	23. Ammonia			X	X
	24. Nitrates			X	X
	25. Nitrites			X	X
	26. Chlorides			X	X
	27. Sludge Age			X	X
	28. F/M Ratio			X	X
	29. Cyanide				X
	30. Heavy Metals				X
	31. Toxic Materials				X
	32. Total Organic Carbon				X
IV	**Supervision/Management**				
	A. Records and Reports				
	1. State and Local	X	X	X	X
	2. Federal	X	X	X	X
	3. Operation	X	X	X	X
	4. Maintenance		X	X	X
	5. Laboratory		X	X	X
	6. Personnel			X	X
	B. Financial				
	1. Purchasing	X	X	X	X
	2. Inventory Control		X	X	X
	3. Budget Preparation			X	X
	4. Budget Review				X
	5. Bonding and Grant Procedures				X
	C. Legal				
	1. State and Local Regulations	X	X	X	X
	2. Federal Regulations	X	X	X	X
	3. Local Responsibility	X	X	X	X
	4. Role of Regulatory Agency	X	X	X	X
	5. Right-of-Way Acquisition			X	X
	6. Code Enforcement			X	X
	D. Public Relations				
	1. Customer Relations	X	X	X	X
	2. Complaint Investigation	X	X	X	X
	3. Public Speaking			X	X
	4. Contract Supervision				X
	E. Personnel				
	1. Planning Work	X	X	X	X
	2. Responsibility of Supervisors		X	X	X
	3. Employee Management and Evaluation			X	X
	4. Employee Training			X	X
	F. Emergency Procedures				
	1. Bypass Reporting	X	X	X	X
	2. Major System Break		X	X	X
	3. Major Unit Failure		X	X	X
	4. Total Plant Failure			X	X
	5. Hazardous Materials			X	X
	6. Alternate Modes of Operation			X	X
	7. Labor Strike				X

TABLE XXVI. (Continued)

Note A

This table is included as an example of how examination criteria can be established for a specific category, in this case wastewater treatment personnel. The same methodology would apply for the other three categories.

Note B

As outlined in this table, the example is designed to provide the maximum possible mobility to the personnel being examined and provides the simplest method of administration to the certifying authority. However, this system may be modified or adapted by the individual certifying authorities to provide for restrictive or "qualified" certification.

For Example:

1. An operator of a Class II trickling filter plant with anaerobic digestion facilities has indicated that he does not want to relocate to another facility nor does he feel capable of answering examination questions concerning activated sludge processes. The certifying authority may elect to examine this individual within the specific area of the requirements for his individual plant. The examination could be designed as:

MODULE I General — All Areas

MODULE II Hydraulics — All Areas

MODULE III Quality Control — *Class II*

A. Process Operation and Theory
1 through 6

B. Treatment Unit Operation
1 through 5, 7, 8, 9, 10, and 12
(omit 6 and 11)

C. Laboratory Control and Procedures
1 through 18

MODULE IV Supervision/Management
All Class II Requirements

2. A local school board operates several "package"-type plants. The school board has designated one custodian at each school to be in responsible charge of the school's treatment plant and the required laboratory work will be performed by another agency. In this case, the certifying authority could examine the custodians in the following manner:

MODULE I General — All Areas

MODULE II Hydraulics — All Areas

MODULE III Quality Control — *Class I*

A. Process Operation and Theory
1, 2, and 3

B. Treatment Unit Operation
2, 3, and 12

C. Laboratory Control and Procedures
Omit

MODULE IV Supervision/Management
All Class I Requirements

GLOSSARY OF TERMS

ABC —Association of Boards of Certification

AWWA —American Water Works Association

CEU —Continuing Education Unit. Defined as: Ten contact hours of participation in an organized continuing education experience under responsible sponsorship, capable of direction, and qualified instruction.

DRC —Direct Responsible Charge. The term "direct responsible charge" shall mean, in smaller facilities where shift operation is not required, active daily on-site charge and performance of operation. In larger facilities where shift operation is required, "direct responsible charge" shall mean both:

(a) active, daily, on-site technical direction and supervision; and

(b) active, daily, on-site charge of an operating shift or a major segment of a system or facility.

This definition would include all personnel with responsibility for active, daily, on-site technical direction and supervision in operations within a system.

EEOC —Equal Employment Opportunity Commission (U. S.)

EPA —U. S. Environmental Protection Agency

FACE —Federation of Associations on the Canadian Environment

GED —General Educational Development test. A standard test which, when successfully passed, normally is accepted as the equivalent of high school graduation.

NPDES—National Pollutant Discharge Elimination System

Operating Experience —Time spent at a plant or system in satisfactory performance of operation duties.

Relevant Formal Education—College-level courses in environmental engineering, environmental sciences, environmental technology, and similar courses of study.

Selective Certification —Certification designed to certify personnel for specific types of facilities. A restrictive form of certification which would permit operation of a specific type of plant within a given class of plants, but would meet the legal requirements of direct responsible charge certification.

Speciality Certification —Certification designed to certify personnel for specific tasks or positions within a system. These positions are not normally required to be certified by law, but personnel in these positions are encouraged to become certified.

WPCF —Water Pollution Control Federation